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NEWSPAPER

H2000s Grow, Model 58 Enhanced

By Michael Weinstein
Of the CW Staff

WALTHAM, Mass. – Honeywell Inc. has introduced two new computers to its Series 2000 family and announced major enhancements including communication facilities for its small Model 58 computer system.

The new models, the 2040A and 2050A systems, can be upgraded later at the customer's site by adding power modules and memory units. Power modules provide increased cycle time and/or input/output capabilities.

Additional standard memory can be added in standard increments to a maximum of 512K characters of main memory. These on-site changes will allow a user to increase power and performance without replacing his current processor, the firm said. Both new models are for purchase only and not for lease.

Model 58 Enhancements

Major enhancements to the Model 58 include a single-line communications controller to permit the linking of Model 58s to each other as well as to any computer using a binary synchronous mode for data transmission, a spokesman said.

System enhancements include the Type PRT printer with speeds of 300, 450 or 600 line/min. A full Cobol compiler that meets Ansi and French standards is also provided, Honeywell said.

High-speed Extended Memory Store provides up to 64K bytes of memory for program storage. The Model 58 also can now handle two additional disk packs that will double the disk storage capacity to 23M bytes of information. A 300 card/min card reader and optical mark reader are also new features.

Model 58 Communications Controller

The SLC 058 single-line controller, which enables the Model 58 to be used as a satellite computer, is a synchronous buffered transmission device that will

(Continued on Page 2)

CW Photo by E. Drake Lundell Jr.

Registration crowds at Wescon watch Margaret Breckinridge operating the Jacquard Systems mini-controlled registration system.

The system uses a Data General Nova 1200, Infoton CRT terminals and Addressograph-Multigraph embossers to provide attendees with plastic embossed registration cards, and to collect data on all attendees.

NEWS IN BRIEF

Xerox Ups Sigma Memory, Adds Disk

EL SEGUNDO, Calif. – Xerox has announced two enhancements for XDS virtual memory system users. Real core memory support is increased from 512K to 2M bytes for the Sigma 9. A disk-only system is provided to replace the rapid-access device (RAD) system for residency and swapping previously required by the Sigma 6 and Sigma 9.

The new features, which will be standard on the Xerox Universal Time Sharing (UTS) system late this year, promise users faster response time, faster processing time in a multiprogramming environment and reduced cost for small users through the use of standard disks, according to the firm.

IBM Fire Probe Continues, Blast Hits Mexico Center

HAWTHORNE, N.Y. – Police continue to investigate the cause of the fire that gutted IBM's Program Information Department here Sept. 10, with arson still a possibility.

Both IBM and the Mt. Pleasant Police Department are conducting investigations, and damages have still not been set, IBM said last week.

Meanwhile, in a related story, an IBM data center escaped serious damage in a Mexico City bombing, only days after the dedication of the six-story building housing the computers.

The data center, with a 370/145 and a 360/40, was on the first floor of the headquarters building for IBM Mexico. Protective glass was broken in the blast, but normal operations proceeded, according to an official of World Trade Corp., IBM's international marketing organization.

The computers, air conditioning and other equipment necessary for operation of the data center all escaped damage, the spokesman stressed.

On the Inside This Week

New Techniques May Help Assure Software Quality

By E. Drake Lundell Jr.
Of the CW Staff

LOS ANGELES – Even though the need to assure the quality of software presently being produced is the "most pressing problem that exists" in the computer community, there is a "lack of interest in software quality assurance in the software community."

So charged a Wescon panel session here last week.

But while there has been little interest in the development of quality assurance methods on the part of the commercial software community, new techniques have been developed which can aid in assuring that software works as promised and meets specifications, the panelists agreed.

What is needed now is a wider application of the techniques – both automated and not – that have been developed in the past to make software systems more effective, they said.

Due to the "complexity of current software development projects, both devel-

Other stories, photos on pages 23, 25

opers and customers are becoming increasingly aware of technological inadequacy in certain phases of the development process," according to panel moderator A.C. Arterbery of the product assurance staff at TRW Systems Group.

But at the same time, he said, "software system validation as a formal discipline has moved extremely slowly.

"Only very recently have the subjects of how you validate, check out and debug software begun to appear in the frequency that these subjects deserve. The main reason for this lack of interest is based on the lack of success in attempts to develop formalized knowledge in this area," he said.

The importance of software quality can be measured primarily by the monetary aspects and the reliability aspect, noted Levi J. Carey, president of Computer Software Analysts, Inc., who presented an overview of the state of the art.

"Software errors have cost millions of dollars such as in the Ranger probe," he said. "The potential for harm through software failure is almost incalculable: a software failure in the Minuteman program or the Anti-Ballistic Missile program could be catastrophic.

"However," he warned, "the unfortunate fact is that a great number of errors remain in the software which neither the

(Continued on Page 2)

Privacy Invasion Charged

State Sued on Data Bank

By Michael D. Sorkin
Special to Computerworld

DES MOINES, Iowa – A lawsuit has been filed here aimed at prohibiting all Iowa law enforcement officials from keeping either computerized or manual identification files on arrested persons with no criminal convictions.

Freeland Walker, a 20-year-old Des Moines youth who once was committed to a state training school for boys after he was adjudged a delinquent and who has seven subsequent felony arrests – but no convictions – filed the lawsuit as a class action. State Commissioner of Public Safety Michael Sellers is named defendant in the suit, which charges the state with "invasions of privacy."

The suit says Iowa criminal identification records are sent to the FBI, where they are "classified and exchanged with law inforcement agencies, other governmental agencies and several classifications of private employers," including railroads, banks and insurance companies.

'No Restriction'

Once identification records leave the FBI's possession, the lawsuit says, "there is no restriction upon the use of these records in the possession of these other agencies." The suit claims this can result in "irreparable harm" to those individuals who have never been convicted of a crime.

The lawsuit claims the state is retaining and disseminating Walker's records in a "reckless, negligent and inaccurate manner."

(Continued on Page 2)

★Special Report: What's 'In' in Input? Follows Page 14

Supreme Court Decision on Software Patents Expected

By Edward J. Bride
Of the CW Staff

WASHINGTON, D.C. – The Supreme Court will hear arguments Oct. 12 on whether software patents are legal.

Recent briefs filed by the software trade association and a holder of software patents claimed that hardware and software inventions are "engineering equivalents," and that if one is eligible for patenting, then the other should be, too.

The Association of Independent Software Companies (AISC) claimed in its *amicus curiae* (friend of the court) brief that the software sold by a vendor "is the reason for buying computers," which are useless without programming.

Whether this programming is in software or hardware is not significant, since either accomplishes the goal of making a special-purpose machine, according to AISC, which recently became a division of the Association of Data Processing Service Organizations (Adapso).

The other brief was filed by Applied Data Research Inc., holder of patents for Autoflow, the automatic flowcharting program, and for an earlier sorting program.

ADR argued against contentions that programs are merely "mental processes," noting the "computer program technology . . . serves solely to provide machine processes and machine devices and is not concerned with mental processes in any way, certainly not in a business way."

If the court were to determine that programs are merely mental processes, then it would have to declare software patents unconstitutional, sources have noted.

ADR and Adapso/AISC are thus attempting to prove that most software programs are machine processes.

The legal controversy surrounds the government's appeal of the *Benson and Tabbot* patent for converting BCD data to binary data; to prove the legality of this particular patent, the inventors show that IBM and Honeywell both have hardware patents for this process.

While only one patent is at issue in this case, the court could strike down the validity of all software patents, if it chooses to rule so broadly, sources have indicated.

Adapso asked the court, however, not to rule so broadly. The computer industry is "twice-dominated" by IBM, in hardware and software, Adapso said, and the importance of this case to the industry should not be tested "by the value of a minor code converter patent."

Its brief covered the area of tie-in ("bundled") hardware/software sales in several parts, in an attempt to bolster its argument that hardware and software devices are engineering equivalents, and that software implies machine processes for applications and system software.

Besides claiming that software is a mental process, hardware manufacturers claim "uncategorically" that software is purely mathematics and "merely a transformation of manual procedures into computer procedures," Martin Goetz, a vice-president of ADR, said.

Hardware manufacturers, through their trade group, the Business Equipment Manufacturers Association (Bema), want to continue their "monopoly" over the software market, Adapso said, by removing patent protection from software.

There are at least seven software patents currently in effect, some being granted only after a Patent Office refusal was overturned by the Court of Customs and Patent Appeals (CCPA).

In the precedent-setting cases, which date back to 1969, CCPA ruled that software patents *per se* should not be considered illegal, if they were worded properly, and the software did in fact make a special-purpose machine out of a general-purpose computer.

The briefs of petitioner – the U.S. Solicitor General, acting on behalf of the Patent Office – and the hardware makers do not deny these findings, according to the ADR brief.

"But by predicating their attack" against the patentability of software programming on the "mental process" argument, the hardware makers are "indirectly attacking these findings," and are, in effect, "seeking their reversal."

In other words, if the court overturns the *Benson-Tabbot* patent on the grounds that it is a mental process, the case could become the precedent for claims that all software programs are simply descriptions of mental processes.

Honeywell Adds 2 Machines, Beefs Up Model 58

(Continued from Page 1)

control data transfer over public or private communications networks between the Model 58 and other computer systems.

Data can be transferred over switched networks at 2,000 bit/sec (baud) or over leased lines at 2,400 or 4,800 bit/sec. The Model 58 thus can be used as a front end for other larger computers, mainly the IBM 360 and 370 series.

The controller will lease for $208/mo on a five-year contract ($236/mo for one year) or can be purchased for $8,800. A basic entry-level Model 58 with data communications capabilities using the SLC 058 can be leased for $1,240/mo (five-year contract with a card system) and $1,410/mo (five-year contract with disk system).

The 2040A is a small-to-medium multiprogramming computer with 64K characters of main memory. Cycle time is 3 *µsec* for two characters. The processor includes two input/output sectors permitting up to 1M char./sec to be transferred over the eight read/write channels concurrently.

Up to 32 address assignments interface peripherals. Main memory can be increased in six increments to a maximum of 512K characters. Cycle time can be increased to 2 *µsec*/4 char.

A first optional I/O power module provides up to 12 simultaneous I/O operations over 12 read/write channels, 32 peripheral address assignments and total throughput of 1.5M char./sec. The second I/O power module adds a buffered third sector for up to 16 simultaneous operations over 16 read/write channels, 48 peripheral address assignments and total throughput of 1.5M char./sec.

The minimum 2040A configuration – including a central processor with 64K characters of main memory, card reader/punch, 650 line/min printer, console, three tape drives and a disk subsystem to store and retrieve 36.8M characters of information – costs $335,000.

Model 2050A

The 2050A is a medium-scale multiprogramming computer with 128K characters of main memory. One buffered and one unbuffered input/output sector permits up to 1M char./sec to be transferred over 12 read/write channels simultaneously. Up to 32 address assignments interface the data communications network and peripherals.

Memory for the 2050A can be increased in four increments to a maximum of 512K characters. Cycle time can be increased to 2 *µsec*/4 char. or 1 *µsec*/4 char. from a standard of 3 *µsec*/4 char.

The first I/O power module provides for 16 concurrent operations over 16 read/write channels, 48 peripheral address assignments and a throughput of 1.5M char./sec by adding a second buffered sector, for a total of three sectors. The second power module adds a fourth buffered sector, increasing the peripheral address assignments to 80 and throughput to 2.5M char./sec.

The minimum Model 2050A configuration – with 192K characters of main memory, a reader/punch, 1,100 line/min printer, console, five tape drives and disk subsystem to store and retrieve 128M characters of information – costs $595,000.

Honeywell has revised its policy to allow any owner of a Series 200 computer to receive a trade-in allowance on a new Series 2000 computer.

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Software Community Blamed for Apathy in Quality

(Continued from Page 1)

user nor the developer are aware of."

Noting that the reputation of the computer community depends largely on the quality of the software it produces, Carey said: "We need quality software in order to reduce software development cost and provide confidence that computer programs will perform as required."

Why Errors Occur

Errors occur, he said, because of three major reasons: each computer program is a custom product; the software product is made up of a large number of instructions developed by people and each of which is subject to error; and there is apparently a professional bias, "i.e., a lack of interest in software quality assurance in the software community.

"There is one other aspect of the software quality assurance problem that I believe is critical," he added. "This is the inability in software to express the quality or reliability of a given piece of software in quantitative terms.

"This lack of a reliability or quality measurement capability is the primary basis for the lack of significant progress in dealing with the software quality assurance problem," he asserted.

Management Techniques

The use of management techniques is one way to overcome some of the problems, he indicated, by applying the concepts of the systems approach to software development. This technique just assures close supervision of projects and will not prevent errors, he added, noting it should be applied more vigorously than in the past.

A second approach is the use of software design techniques or structured programming which reduces elements of the program to modules for testing. While these techniques are useful, he stressed more research is needed to fully understand them.

The development of "testing strategies and the correlation of them with software reliability, I believe, is the answer in the near future. Aids in software quality assurance are needed now and this approach offers the greatest potential in the near future."

More data is needed, however, to develop the best quality assurance methods. This data would be "statistical summaries of the error population and error patterns in software," he said, while asking the entire software community to help develop these statistics.

Some of the techniques developed for validating software in the aerospace environment may have application in the commercial environment, Raymond Rubey of Logicon Inc. stated.

The aerospace environment differs in many ways from the present commercial environment, he said, pointing to the involvement of top management in overseeing software quality as one of the major differences.

Validation Responsibility

He also said that "in most aerospace software development, the responsibility for validation is given to an organization other than that responsible for programming and check-out. This independence is valuable, indeed required, because different attitudes are needed for validation."

Instead of trying to make a program work, the validation organization should try to make it fail, he said, and the independent organization would be more likely to work hard at uncovering errors and would not be motivated to cover up error conditions.

State Sued on Files

(Continued from Page 1)

Dan Johnston, an attorney for the Iowa Civil Liberties Union, prepared the lawsuit.

Polk County District Court Judge Leo Oxberger is expected to hold a hearing soon on Johnston's motion for a temporary injunction against Sellers.

Almost all criminal identification records in the state are now being computerized as part of the state crime computer. Computerization of the records has become controversial because Lencir, a Des Moines subsystem of the state computer network, has been keeping secret files on "persons of interest." The files label the suspects as "known criminals," although some of the individuals have never been convicted of any crime whatsoever [CW, Sept. 20].

Correction

The caption for the picture on page 4 of the Sept. 20 issue should have read Paul J. Dixon.

THE THIRD CRUSADE

STRENGTHENING PROGRAM AND PROJECT RELIABILITY

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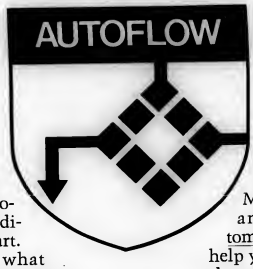

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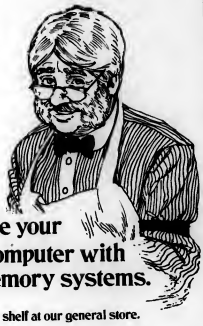

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Surpasses Hard Copy, Study Says

Growth in CRT Output Use Booming

NEW YORK – A recent survey of large computer users by Great Northern Nekoosa Corp. found the use of CRT output growing almost twice as fast as the use of hard-copy output.

Growth of CRT output averaged 86%. At the same time, the use of hard-copy output grew on an average of only 45%.

A majority of the firms surveyed, Great Northern said, indicated the growth of CRT use will continue to outpace that of hard-copy over the next five years.

It is interesting to see how the respondents obtained hard copies of information provided to them on CRTs. In 20% of the cases, the CRT user writes down the information and then copies it on an office copier. For 10%, the user takes the information down, a secretary types it and then uses an office copier.

In 15% of the cases, the user employed other means of getting hard copy, such as addressing the information to a receive-only computer, line printers, and, in only one case, using a hard-copy attachment for the CRT.

At the same time, it was also found that the office copier was the most used method of receiving extra hard copies from a printer. Of those surveyed, 65% used this method, and 20% used other methods such as 5-part paper, 4-part paper and repeat prints on a line printer.

The study also asked the users what premium they would be willing to pay for a computer paper that increased the speed of computer printouts by 5%.

Of the respondents, 9% said they would pay 50% more; 27% said they would pay 25% to 50% more; 46% said they would pay a small premium of less than 5% more; and 18% said they would pay no more for the increased speed.

Of the firms surveyed, 59% used CRT terminals for file maintenance; 53% for accounting; 53% for billing/purchase; 53% for financial analysis; 53% for customer credit; 47% for order entry; 47% for computer program development; 41% for inventory control; 35% for personnel records; 18% for production scheduling; 12% for engineering and scientific computation; and 12% for planning models.

In the next five years, 54% of the respondents planned to use CRT terminals with microprinting capability; 71% hoped to have CRTs with hard-copy output; 9% planned to use character printer terminals; and 38% planned to have line printer terminals.

Biggest Obstacle in Daily Business Is...

By Edward J. Bride
Of the CW Staff

MONTREAL – The fact that a chief obstacle to MIS development is people-to-people communications may not surprise computer users.

The fact that this is also an obstacle to day-to-day operations, however, may be disconcerting to a DP manager.

CW Photos by Edward J. Bride

Weller

Justice

During the recent annual conference of the Society for Management Information Systems (SMIS), *Computerworld* asked attendees what was the "biggest obstacle to DP use" in day-to-day operations.

"People" and/or "MIS" figured in every response, highlighting the interrelationship of these aspects of computer use.

Richard Justice, manager of systems, Chevrolet Engineering Division, Detroit – "Setting priorities and recognizing these priorities by users is a big problem.

"In systems design, it's probably making users realize we're not automating an old process, but designing a new one. It's the age-old problem of user involvement in the planning of systems."

Robert Weller, director of management systems, General Mills, Inc., Minneapolis, Minn. – "The basic problem is still getting users involved in the design of systems they need. It's been going on for years.

"The DP professional will come up with so-called 'good' systems, but if the actual users don't participate, then it's a waste of money."

Williston Cofer, systems accountant, U.S. General Accounting Office – "From our point of view, the big issue is getting a systems design that really meshes with management needs, and within time frames. Also, more applications and systems need to come forward, not individually, but as a group.

"People say there's no such thing as MIS, but that's too much negativism, and that's not the question. Have we developed master plans over time, and do we work towards that goal?"

CW Inquiring Photographer

Walter Kennevan, director, MIS program, Center for Technology and Administration, American University, Washington, D.C. – "There has been tremendous progress in MIS, but the current problem is primarily with communications between users and designers. The negative approach appalls me; the value of information must be stressed, despite what appears to be slow progress."

Cofer

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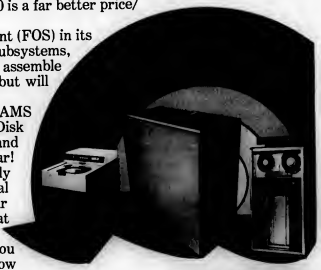

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Nasis Looks at DP Systems — Part 1

Payoffs Dramatic With Inter-User Program Transfer

By Edward J. Bride
Of the CW Staff

LEXINGTON, Ky. — "Potentially spectacular payoffs" in both time and cost savings await users who coordinate system development among two or more computer sites, or who can effect transfers of such systems, according to a report issued by the National Association for State Information Systems (Nasis).

Part I of this series includes program transfer and computer utilization. Part II will examine personnel training, the expressed need for standards, the use of outside consultants and procurement habits of the states.

Copies of the entire report are available for $5, from the Nasis Secretary, Council of State Governments, Iron Works Pike, 40505.

The report acknowledged that incompatibility of program languages between different types of hardware prevents the achieving of broader-based transferability.

"Recent developments in vendor-oriented data base management languages accentuate this problem," according to the annual report, entitled "Information Systems Technology in State Government."

Many Lessons

Though compiled from a survey of government users, the report has many lessons for business computer users, particularly regarding other obstacles to full computer usage.

For example, the respondents to the survey listed management understanding and management commitment as two of the top four problems — mainly outside the direct control of the information systems authority.

The other two problems would relate more to large, multidivisional businesses or to government. They were listed as resistance to consolidation and agency cooperation.

Nasis speculated that the resistance to consolidation may be a transitional problem which will gradually disappear as functional centers are formed in some states while centralized centers emerge in others.

Benefits of Transfer

While it is comparatively simple to transfer legislation, policies or management techniques among agencies, the "most visible and dramatic effects" of transfer result when systems developed in one state are used by another state, the report said.

The history of such transfers includes just design documentation or program documentation in some cases, and "relatively infrequently, an entire system is transplanted either actually or virtually as is," the report noted.

These transfers represent only a small part of total systems development among the states, the report commented, adding, "there remains an enormous area for increasing transferability with potentially spectacular payoffs in terms of both time and cost savings."

Other Obstacles

The obstacles, the report continued, include differing requirements among the states. "Most systems are not designed with sufficient flexibility to accommodate changes within one state, let alone differences among states," the report suggested.

Other recommendations gathered from the results from 43 states included more management training, better internal costing methods, federal-state cooperation in developing standard data elements and the formation of EDP advisory committees.

Costs Still Increasing

Besides collecting these user opinions, the report surveyed trends in EDP expenditures and usage, and came up with an interesting statistic: the number of CPUs has apparently leveled off, but expenditures are still increasing rapidly.

Exactly how fast costs are rising remained a mystery because of deficiencies in accounting systems, cost analysis, documentation, personnel records and other management information needs, according to the report.

Though these shortcomings made a comprehensive, comparative graph impossible, the more important result, Nasis said, is that these inadequacies "make it virtually impossible" to inform top management of the performance of the information systems function.

Even so, the report indicated that "information systems costs are not only increasing but are generally increasing at a substantially more rapid rate than other governmental expenditures," the report said.

And all this occurs despite the fact that "the absolute number of computers in state government is stabilizing." Thirty-one states reporting last year and in the current survey showed a net increase of only two computers, from 322 in the previous report (1969-70) to 324 in the current report.

The increase was in the medium-to-large-scale range, with a decrease in the number of small computers and minis reported.

Proliferation Cut

This stabilization indicates success in reducing computer proliferation, and in making more efficient use of existing DP resources by establishing functional centers, moving toward CPU consolidation or adding additional shifts, the report claimed.

The leveling-off also reflects the "increasing computer throughput per hardware dollar, a change in configuration of equipment and improvd utilization," Nasis related. The increase in medium to large computers and decline of small systems would seem to support at least the middle portion of this observation.

California, which has been in the forefront of the trend toward functional centers, did not report its 1971 computer inventory. In fact, four states with a total of 89 computers reported in the previous survey did not respond to the current one.

This inability to respond was due in part to inadequate information systems within the information systems function itself, Nasis said.

Among the appendices to the report is a table of applications, listed by individual state, including CPU type and size, language and other specifications.

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Editorial

Software Protection

The question of whether software can be patented is now before the U.S. Supreme Court.

During the progress of the case the importance of software has increased, thereby increasing the importance of the decision.

The trend had been toward implementing more and more of the systems software in hardware form. And hardware can be patentad.

Now the trend is toward variable microcode and "universal host" machines. The hardware is becoming just a shell with all of the logic in software form.

This trend creates a situation where "old" machines can be continually enhanced by the writing of new and better microcode. But unless this new microcode can be protected by law, a lot of the motivation for writing it will be lost.

We hope the Supreme Court, whatever it decides in the current case, will comment favorably on the importance of software protection and offer recommendations for correcting any faults in the current laws.

ACM President Defines Goals

Setting Priorities Top Concern

By Anthony Ralston
Special to Computerworld

From the Aug. 23 article, "What Are ACM's Goals" and the cartoon in the Sept. 6 issue, a reader might conclude that ACM has no goals and that I, as president, think it should have none. But both conclusions would be false.

Of course, ACM should have – and does have – goals. What I am opposed to, and believe seldom leads to anything useful, are committee studies which attempt to set goals for the future for established organizations.

The almost inevitable result of such studies is the restatement of current, well-understood and agreed-upon goals (the motherhood syndrome) and the listing of new goals without much relation to the resources or leadership needed to implement them (the blue-sky syndrome).

The fact is that major changes in the goals of any organization are either forced by outside circumstances or are the result of

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the leadership of one or a small number of persons; committee studies tend to be at most window dressing for such changes.

Continuing Goals

In ACM's case our continuing goals of quality publications, development of a broad range of special interest group activities and support of regular and student chapters should be clear to all ACM members.

Other goals which involve the establishment and maintenance of professional standards, dissemination of information on computing to the public and various education-related activities, to name a few, are also well understood.

And, of course, although there is not space here to discuss them, the current ACM administration has goals of its own for which it is and will be seeking support from the ACM Council and the membership at large.

When organizations do not have goals or have officers who do not recognize established goals, the result is drift. ACM's first quarter century of growth in size and quality of activities, both of which are continuing, could not have been achieved without goals.

Clear Goal

Our current financial problems – one clear goal, by the way, of the current administration is to do something about these – are not the result of having too goals.

On the contrary, they result in part from having too many goals and not enough setting of priorities, a much more important activity, I believe, than studying goals.

'Sure He's in the File - It's a Crime to Go Around Looking Like That!'

Add Right of Anonymity To Bill of Rights (Rats!)

By Thomas O'Connor
Special to Computerworld

We hear much talk these days about privacy, data banks, bugging, surveillance, Social Security numbers or universal identifier numbers. Society and its legal institutions unreasonably demand that everyone "belong." But the human's right to singular dignity and solitude should permit man to be born, live and die

Viewpoint

without society ever taking note.

Man's obligation to society is locked in the erroneous notion that we must continue to maintain imaginary boundaries and hierarchies on this space station Earth. The "territorial imperative" and similar rationalizations perpetuate the fallacy.

'Right of Anonymity'

I have for some time mulled over the idea of a guarantee to the "Right of Anonymity" as an adjunct to the Bill of Rights.

This immediately raises the question of how to maintain a semblance of order in our complicated society. For instance, the Internal Revenue Service might lose touch with most of its clients overnight. The draft and its constitutionally questionable discriminatory registration would almost certainly cease to exist.

I might be willing to consider some trade-offs to gain a degree of anonymity. I just might consent to a universal identifier number in return for the constitutional guarantee that *no other* data about me, except that which could be gleaned from the number itself (sex, year of birth, serial, etc.), will ever be required, or be legally permitted to exist in any context without my express consent.

This means no U.S. Army or Birch Society dossiers, no credit records, no medical records, no security records, no police history records, no academic records, no mailing lists, no nothing, without the individual's direct participation and consent, and even then, subject to recall at his request.

Having been involved for 20 years in applications of the computer, I am well aware of the real and potential abuses to privacy, both deliberate and unwitting. The present rate of proliferation and sophistication of this electronic iron maiden is both frightening and discouraging.

Perhaps an action movement, for which the time is right, is necessary to head off the further destruction of mankind's serenity and solitude: the Right to Anonymity and Tacit Secrecy (Rats)!

Thomas E. O'Connor is manager of information processing systems at Raytheon.

Letters to the Editor

Pleasant Surprise Beats Disappointment

Alan Taylor [CW, Sept. 6], takes IBM to task for supposedly withholding performance information on the new 158 and 168 machines. His suspicions are aroused, he maintained, because the 158's memory is twice as fast as that of the 155, while IBM cautiously opines that performance will go up "20% to 40%."

A machine like the 158 (or 155), with a high-speed buffer memory, has effective memory speed more dependent on the buffer than on main memory. The buffer in the 155 and that in the 158 are of apparently identical performance, hence overall machine performance should not be much different.

With Dynamic Address Translation (DAT), some fetches (most of those from main memory, in fact) require three access cycles rather than one. Therefore, it is not hard to see that faster main memory would he needed in the DAT environment.

It is also not difficult to see why IBM should be cautious in its performance assessments, since DAT makes overall performance even more sensitive to peculiarities in user programs and in the OS/DOS components not yet optimized for the new environment.

Better to have users pleasantly surprised than disappointed.

Walter R. Beam
Chappaqua, N.Y.

Telecommunications Course Available

I concur with my former colleague Frank Oliver [CW, Aug. 30] that there is a pressing need to train data communications personnel. But when he says that there are no formalized courses of education, I believe he has overlooked an item in the May 17 issue of *Computerworld* which states the University of Colorado has a Master of Science program in telecommunication management.

The course content includes telecommunications, communication theory and regulatory concepts. This program would appear to be a step in the right direction.

David Silber
Shell International Petroleum Co.
London, England

'There Are No Records'

Regarding "Here's the Real Truth About Computer Records" [CW, Sept. 6]: There are no records in the world because nothing is permanent; however, there are significant attempts at record keeping.

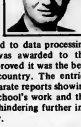
What has been done in attempts at record keeping has been to trade relative permanence for increased accessibility for quantity processing.

Daniel Reeves
Loma Linda, Calif.

National Recognition for DP Entry Students Possible

DP employers can soon rest assured that the students of good DP schools have achieved a definite quality level of education – if the DP educational community aggressively follows up the lessons learned in the Furr Challenge Cup Contest. This verdict follows the awarding of the cup to cowinners Long Beach Control Data Institute and Coleman College at the San Diego ceremonies.

The Taylor Report
By
Alan Taylor, CDP



The competition was open to any data processing school in the country, public or private, solely dedicated to data processing or not. The cup was awarded to the school which most proved it was the best DP school in the country. The entries consisted of five separate reports showing the quality of the school's work and the problems that were hindering further improvement of quality.

The reason for the award was, among other things, that the school could not just guarantee the student would study in an environment of reasonable quality – and therefore should presumably graduate with a reasonable amount of knowledge. Many schools can guarantee the quality of instructors.

What Long Beach really did was guarantee the quality of the instruction actually given, and what the student would actually learn – a very different matter.

The school reversed the concept of a DP course as a simple trust in a "brand-name" to a control of the actual quality of the course.

Students Get Control Lists

Chuck Culver, dean of the school, originated the quality control method in which the school produces for its courses a complete list of contents on a lecture-by-lecture basis. The students get copies as do potential employers of the students, if they wish.

As each instructor lectures, the student can review his lists and check whether all the subjects involved are covered, and that they are understood. If the instructor misses one point, the students can – and do – remind him of it!

Under the previous "brand-name" concept of quality the instructor is expected to protect the quality of the student. The examinations are therefore geared to whatever the instructor happens to have taught. They measure, at most, the capability of the student to understand what he has been taught.

But at Long Beach the examinations are based on whether the student has learned what he is *supposed* to have learned – a very different requirement. This method checks on his capabilities by comparing the course contents he is supposed to have learned.

When he passes the exams, they give his employer a good indication of what to expect.

Moreover, the instructor is not in a position to influence these results significantly. He does not see the examination until just before it is given. Long Beach uses sealed examinations. The instructor still grades – but under a set of public and stringent rules. His grading and the students' papers are forwarded to the dean of the school, as a further review procedure.

"A sealed examination, or one of known quality, could assure that a student who graduates from a school in the Midwest be recognized by an employer, local or otherwise, as a quality student."

97% Placement!

The Long Beach school produces guaranteed quality students. The employers seem to like them. The current placement ratio is approximately 97%! This means 97% of the graduating students has been placed in DP positions! That is a product a school can be proud of.

Here is a technique the DP educational facilities can universally practice. Take, for instance, the sealed examinations. These are a valuable idea.

A sealed examination, or one of known quality, could assure that a student who graduates from a school in the midwest be recognized by an employer as a quality student.

Briefly, an impartial third party – such as the Society of Data Educators – could check examinations for "reasonableness" before allowing them to be given, and then check the results for the individuals.

In fact, it would be a straight modeling of the Long Beach scheme, but simply using a national level instead of the dean's office as the approval area for the examination, and the approval of the grading.

This would certainly improve the image of DP schools. We could know those who cared for their students and who were providing good education.

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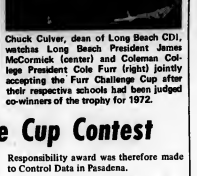
Dr. Enoch Haga, executive director of the Society of Data Educators, and Alan Taylor keep in touch with all contestants through a nation-wide conference call during the judging ceremonies. The conference call engineer is in the back room.



Chuck Culver, dean of Long Beach CDI, watches Long Beach President James McCormick (center) and Coleman College President Cole Furr (right) jointly accepting the Furr Challenge Cup after their respective schools had been judged co-winners of the trophy for 1972.

There Were Other Awards in the Cup Contest

Long Beach was not the only award winner in the Furr Challenge Cup Contest. In fact, it only shared the top prize with Coleman College. At one point Coleman tried to give Long Beach the cup's pedestal while keeping the cup itself! In the end, however, both cup and pedestal left for Long Beach.

Florissant Valley Community College in St. Louis was honored for the best service to the student body, gaining 17 of the possible 20 points. This was based on the judging of the value of the Hypo simulator which replaced the use of the Programmer Aptitude Test entry, and on the use of competitive team case studies.

Computer Processing Institute, East Hartford, Conn., got 20 out of 20 points – the only 100% score awarded – for the community service it was providing by accepting many individuals into its classes for rehabilitation – and actually rehabilitating them.

Technology Advance

The Coleman College award was for the advances of DP educational technology, within the college. This award, which gained 19 out of 20 points, was based on the teaching of pure programming (as opposed to coding) and encouragement of controlled group interaction in the classrooms, through special tables and closed-circuit TV.

Long Beach, in addition to the guaranteed student quality, was judged highly for its service in keeping the student actively under instruction after graduation – until he would enter his chosen field.

A tie vote of 17 points matched Kirkwood Community College and Long Beach for the Excellence in Professionalism award. The activity of the Kirkwood student chapter was pitted against the three-level test development in Long Beach. On a revote, Kirkwood lost by one point.

Pasadena Challenges Judges

This was not the end of the awards. A protest march by the last class of graduates from Control Data's Pasadena institute, under their instructor, Bonnie Johnston, arrived an hour after the main awards were given. They protested that a complete category had been omitted from the awards.

"The quality of a school can be seen in bad times, as well as in good. The responsibility with which it faces disaster is a measure that is not to be ignored," Johnston claimed.

She explained that when the Pasadena school was being phased out, all students received six months' notice, received an offer of full return of tuition money, transfer with partial transportation payments to other schools, and the school still continued operating and running classes for six months.

Dr. Enoch Haga, executive director of the Society of Data Educators, supported Johnston on her claims, and a special Responsibility award was therefore made to Control Data in Pasadena.

New Cup to Challenge

Later, another complete cup arrived with a new challenge. This came from Long Beach CDI, the cowinner of the original Furr Cup – but it was not from the school itself, but from the student body.

The challenge was for any other student body in a DP school to show it was more useful, both within the school and in other ways.

It will be a hard challenge for other students to meet, because the student government at Long Beach is unusually active – evidence its action in presenting the challenge.

Excellence Crested

All this did, however, show that the Furr Challenge Cup has been a success. Honors to those deserving of them are available, and people are interested in trying. The search for excellence is turning out to be a way of creating excellence. And that was the function of the contest.

Congratulations to all the worthy schools which entered, and I hope we have more awards for the 1973 Furr Challenge Cup Contest which is being organized by the Long Beach Control Data Institute.

See you all in Long Beach in 1973.

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Politics of In-House DP Misunderstood by Many

By Marvin Smalheiser
CW Correspondent

LOS ANGELES – When computers and information systems are plugged into companies, top management must be ready to cope with significant shifts in political power to the computer center, a computer management consultant warned here.

Einar Stefferud of Einar Stefferud and Associates said top management must make adjustments as the computer infiltrates the company and accumulates power – otherwise the computer may foster political infighting.

Management, he said, must understand the politics of computing but too often it is taught by computer technicians about computer techniques. Management is not taught what the computer will do to a company's organization chart or power politics.

Chief among the problems for top management dealing with computers is establishing and maintaining accountability, Stefferud told a recent meeting of the Los Angeles Chapter of the Association for Computing Machinery.

Top management's most important job is to manage accountability, but it doesn't understand computers well enough or how they affect accountability, he said.

"When an administrator is good, he holds accountability sacred. He won't give it up," Stefferud said.

The computer center becomes the target of buckpassers, he said, because it has authority over resources of other departments.

The accountability of departments must be preserved, he said, and for that they must have authority over their own resources.

Centralization and sharing, he said, also can be dangerous enterprises if management is not aware of the cost of managing sharing and the time required by management to solve the problems of sharing.

Top management, he said, must distinguish between users, customers and managers. But too often it does not and doesn't realize to whom it is talking when it tries to solve a problem.

Users, according to Stefferud, are not always customers. They are the ones whose use justifies a service, while a customer pays the bill. The manager is the vendor who supplies value at the least cost.

How Old Is Your Baboon?

SAN ANTONIO, Tex. – Baboons are similar to humans in many ways, including reticence about divulging their age, but a computer is helping scientists at Southwest Foundation for Research and Education unravel this mystery.

Determining a baboon's age is important because the foundation is engaged in medical research on drugs to combat heart disease, including hardening of the arteries in baboons.

The ultimate goal is applying this knowledge to humans. Baboons are the only animals that will develop hardening of the arteries like humans, researchers said.

Surgeons at the foundation also use the animals to develop open heart, neural and vascular surgery techniques.

The ages of many of the 500 baboons at the foundation are unknown, because the animals were captured in Africa, rather than raised in captivity.

An IBM 1130 was used to analyze data collected over five years on monthly measurements of skull, muzzle and forearm development in 200 young animals, along with X-rays of tooth development.

Growth averages of each body part were calculated, giving statistics on the reliability of each body part in determining age.

Now a researcher can feed into the computer any or all of the four measurements of an animal of unknown age and receive an estimated age that is accurate to within one month on animals under 40 months old, according to Dr. O.M. Reed, developer of the technique.

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Duplicate Tax Billing Adds to Some Drivers' Grief

ASHLAND, Mass. – Residents here who received computerized duplicate auto excise bills now must present their canceled check or other proof of payment to the tax collector's staff here.

Town Treasurer Philip Mahoney said residents were asked to show proof of payment for previous identical bills because "we don't know the bills are duplicates until someone points this out to us. If someone has a bad memory, he could very well pay a bill twice.

"I don't know that the magnitude of the duplicates was, but it was substantial," he said.

The town receives the bills from the state Registry of Motor Vehicles in stages, or commitments, and the duplications occurred in the different mailings.

"Part of the problem in a situation like this is a lot of people don't understand that the Registry of Motor Vehicles makes up the bills, not the people in the local tax offices," Mahoney added.

The Ashland assessors office, which receives the bills from the registry and passes them along to the treasurer's office for collection, was on the lookout for duplicates.

Elaine D'Orsay, secretary for the board of assessors, said she went through about 7,000 bills and pulled out "quite a few of the duplicates and made a list and abated them."

"There have been duplicates, and bills sent to people who haven't had that car for two years," she said. Some people registering cars in September, for example, received bills for September through December, and again from October through December. The bills also indicated different license plate numbers, she added.

In some instances of duplicate bills, she said, the sheriff "went after" the delinquent accounts, only to find the people had in fact paid their bills, so "that made for hard feelings."

At the Registry, DP Director Charles McGlynn said he kept hearing about the duplicates, but could not determine any significant amount. His department ran a random check of billings for the letter "A" in the Boston area, and "certainly, if the duplicates were going to pattern, they should have showed up," he said.

The registry sends to the assessors' offices an accounting sheet listing alphabetically the persons being issued bills, he added.

"The only thing we can think of is that other people might call these bills duplicates and we would not. In other words, confusion of renewals and reissues," he said.

Some of the applications for registration in mid-year, he said, did not indicate whether a person was renewing his registration or registering a different car.

In cases where there were doubts, the department issued a bill, he said. But these wouldn't have been of that magnitude, he noted.

The present state system of two-year registration has "caused a number of problems," McGlynn said, because of the number of transactions that could occur during that time for one vehicle. "We have to rely on the data that's on the applications.

"If they don't agree with each other then we're never going to match them up. We can catch some of them by cross-checking by vehicle ID number, but if that number is different, there are two records affected.

"Over a two-year period, the amount that gets crossed up this way is horrendous," McGlynn said.

The number of excise bills sent this past year was about 3.4 million "and no matter how we do it, there's always going to be a percentage in which the information received is inaccurate or which is punched inaccurately."

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In addition to speed and economy, this new data set also offers convenience. Local and remote loop-back testing is accomplished by operating a three-position test switch. Seven lamps on the front panel indicate the status of the set at all times.

And solid-state technology from Bell Laboratories fits all these features into a compact housing 16 by 11 by 4½ inches.

For details on the new "dataphone 4800" data set, including its low price, call your local Bell System Data Communications Consultant.

AT&T and your local Bell Company.

1401 User Helps Draft Evaders

Special to Computerworld

SOMEWHERE IN CANADA – A small Canadian service bureau which uses an IBM 1401 is run by an antiwar activist and all six employees are U.S. draft evaders.

The service bureau office is reportedly used as a first stop by many fleeing Americans. A few are actually given jobs and those who show aptitude are given programming training by the rest of the staff – using free IBM supplied manuals.

Three who showed particular promise were sent recently to a free IBM course in 360 programming on the basis that the firm planned to buy a 360. All three reportedly moved on to other computer jobs in Canada, one with the government.

The story was revealed last month by one of the partners in the firm who, while sympathetic to the cause, sold his interest in the firm because he felt that his partner was worrying too much about draft resistors and too little about customers.

Voter Registration Data 'Taped'

SALT LAKE CITY, Utah – Information about voters in Salt Lake County stored in the county computer system is available to political candidates. The voter registration data may be put on the candidate's own magnetic tape for about $50 – which is one-fourth the cost of a computer printout done by the county, according to county DP director Dale S. Perry.

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IEEE Group Eyes 'Professional Fields'

By Edward J. Bride
Of the CW Staff

NEW YORK – The recession, public opinion of technology and concern over professional practices have caused one of the country's largest technical societies to consider broadening its interests.

Under proposed amendments to the constitution of the Institute of Electrical and Electronics Engineers (IEEE), the group will formally abandon its formerly strictly technical orientation, expanding its activities in "professional fields."

Societies/ User Groups

The IEEE Computer Society (IEEE/CS) has about 17,000 members, representing about 10% of total membership. The mail balloting, currently under way, was a topic of broad discussion during the society's recent annual conference in San Francisco.

Ballots are due by the end of the month, but the results are not expected for several weeks.

The amendments are expected to pass, an IEEE/CS source suggested, since they were defeated last year by a "narrow margin," when they were strongly opposed by officers of the organization.

This year, they carry the strong support of the president, vice-president, executive director and professional activities committee chairman, among other "top management," the source said.

Survey Is Example

IEEE officials cited a recent membership survey as an example of the need for work in the professional area; in fact, it was also cited as an example of such work.

The survey disclosed salary progress and fringe benefits of some 40,000 members. Among the disclosures were the following salary statistics on computer people:

- The largest salary bracket for software types was $15,000 to $19,000, with 28% reporting in this pay level.
- The next-largest salary bracket for software types was $11,000 to $15,000 (24%), followed by $19,000 to $23,000 (19%).
- Hardware types were almost evenly divided into the same three pay levels.

Besides salaries, the survey showed the need for a pension plan, which IEEE will establish if the constitutional amendments are passed, sources said.

The new amendments would also permit the preparation of "guidelines for professional employment of engineers," IEEE related.

In explaining the reasoning behind this item, IEEE said that ethics in hiring, firing and retaining engineers is a matter of "vital concern both to employers and employees, and the IEEE will do everything in its power to improve such a relationship."

Besides position papers on technically oriented subjects such as energy, cable television and research and development policy, "professionally oriented" topics would also spawn position papers, if the amendments pass.

Included in this category, IEEE said, would be government policy on automation and productivity, as well as the "impact of societal aims on engineering, and vice versa."

While salaries and fringe benefits will be of concern to members, the proposed amendments contain the following pledge:

"The IEEE shall not engage in collective bargaining on such matters as salaries, wages, benefits and working conditions" which are "customarily dealt with by labor unions."

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British Computer Society Makes Waves In Privacy Sector

LONDON – The British Computer Society is earning a reputation as the UK's privacy watchdog. Three facts highlight this trend.

- The BCS has adopted the 10-point code for handling personal data-banked information as recommended by the government's Younger Committee [CW, July 26].
- An official of the U.S. Federal Government has applied for BCS membership, as a means for keeping track of developments in the privacy arena.
- BCS is now considered in the forefront for developing a code of ethics for the computer profession, local sources claimed recently, with publication of the code expected in January.

These actions are all in contrast to a considerably lower degree of concern over the privacy issue here than in the U.S. The Younger Committee report, for example, discounted computers as a threat to privacy, largely because of lack of evidence, but also because of a lack of concern exhibited by the populace.

The society criticized the Younger report because the problem is "likely to become more pressing, not less pressing."

The group is conducting a survey on the extent of data collection on individuals.

Random Notes

Business Packages Adapted To Run on DEC PDP-11 Mini

NASHUA, N.H. – Most of the application packages originally developed by Dataroyal Inc. for use on the IBM 360, have now been adapted by the company to operate on the DEC PDP-11 as well, a spokesman said.

Generally business-oriented, the packages include accounts receivable, accounts payable/general ledger, and inventory control. In addition, the company has labor and materials planning, stockholder accounting and wholesale distribution billing and inventory packages.

The packages can be purchased or leased from the company offices at 235 Main Dunstable Rd., 03060.

'Easytrieve' Gains Facilities, Takes Less Core in New Version

SILVER SPRING, Md.– Better report formatting, table look-up, file creation and updating capabilities have been added to the Easytrieve software system by its developer the Ribek Corp. The enhanced package also supports multi-file input.

While its capabilities have been improved, Easytrieve's core requirements have been reduced to 24K. The retrieval system operates under either OS or DOS/360, and is available for $2400 for under a purchase agreement, from International Systems Inc., in King of Prussia, Pa., or from Ribek, at 10425 Burnt Ember Drive, 20903.

Packages Use NCR Century 200s

SAN DIEGO – Infonational Inc., formerly Ancom Systems, has adapted its $12,500 General Ledger and $10,000 Accounts Payable packages to run on NCR Century 200 CPUs. They will operate with as little as 32K bytes of memory.

A Fixed Asset Accounting package, designed originally – like the others – for the IBM 360, can be made ready for the NCR CPU in 30 days, a company spokesman said from 1250 Sixth Ave., 92101.

Cybernet Opens N.J. Office

UNION, N.J. – Local users will be able to work on projects at a regional office of the Cybernet time-sharing service, just opened at 700 Rahway Ave., by the Cybernet vendor, Control Data Corp.

Terminal equipment available for users includes a keyboard and CRT display, a card reader and printer.

Food Data Is on Tape, Cards

SILVER SPRING, Md. – Data sets containing food composition information developed by the Department of Agriculture are available on either magnetic tapes or punched cards, from Dynamic Data Services Inc., 8055 13th St., 20910. The sets are taken from the Home and Garden Bulletin No. 72, and from Agriculture Handbook No. 8.

Cobol '73? 74?
Compilers Will Support Current Usage

By Don Leavitt
Of the CW Staff

WASHINGTON, D.C. – In Cobol Information Bulletin No. 16, American National Standards Institute (Ansi) technical committee X3J4 lists each of the important changes it proposes for the new Cobol standard. Many of these are flagged "may require changes in existing programs," but the warning is milder than it seems, according to Harry T. Hicks of Information Management Inc. and a longtime member of X3J4.

Most compiler makers have learned that it is both easier for them and easier for the user if they leave in old, well-liked features, even while they add new required ones. In that case, users should be able to run current ANS Cobol programs under any new standard, he said.

"Enhancementa" OK

As long as a compiler provides the features called for by a new standard, it may contain as many "enhancements" as the implementor wishes, agreed X3 Secretary Robert Brown of Honeywell Equipment Manufacturers Association (Bema).

Brown said he hoped this provision would clear up one possible source of comments about the first draft proposal for an updated Cobol standard.

He still encourages users, however, to make their views known about any part of the proposal now, during the initial comment period.

The comment period will end four months after notice of the draft proposal's availability is published in the Ansi Reporter, and X3J4 will consider each comment as it is received.

In any case, at the end of the comment period Brown will issue a "6 week" letter ballot to all X3 member organizations. The ballot will include a summary of all comments and all X3J4 responses. Each X3 member is expected to answer this ballot, Brown noted, and any negative votes will be brought to the attention of the entire membership.

As X3 Secretary, Brown is empowered to determine when a consensus has been reached. Assuming a positive vote on the letter ballot or ballots – if major issues have been unresolved in a single go-round, Brown can declare X3 in favor of the proposal whenever 75% to 80% of the membership agree.

As a final step to insure that nothing serious has been overlooked, Ansi's Board of Standards Review is asked to confirm that a consensus of X3 does in fact exist. This board has a judicial rather than a technical evaluation function, Brown noted. A 10-day ballot, in which only negative votes need be cast, is generally sufficient to satisfy that. The Board is made up of 15 members, none of whom are DP experts, Brown explained.

Depending on the number and severity of the comments originally received by X3, the entire standardization process can take anywhere from three months to a year after the comment period ends. The new standard is identified by the year in which it is approved.

"I hope it will be Cobol '73: that's what we're calling it internally," Brown concluded.

Conflict-Free Schedules Built With Nasa-Developed Software

ATHENS, Ga. – Scheduling of activities in which priorities and required resources, rather than time and technical dependence on prior events, determine the sequencing the events can be handled by the massive Computer Assisted Network Scheduling (Cans) system, now being distributed for $550 by the Cosmic clearinghouse.

Originally developed for National Aeronautics and Space Administration (Nasa) chores related to missile launches, Cans can build a conflict-free schedule of actions, or events, for a specified period for as many as 100 pieces of equipment at each of 100 locations.

To do that, however, it requires 300K bytes of available main storage and direct access storage for data files of 7.2M bytes.

The system operates under OS/MVT. With "some" modifications, the program can operate under OS/MFT. In view of its vast storage needs, it would appear a natural for IBM's new virtual storage environment.

In general the system accepts scheduling requests, organizes these requests into time-ordered groups by priority and then creates the best schedule. It can be used either in an interactive mode or as part of a batch operation.

In either case the user specifies the desired schedule and the priorities associated with each of these items. The system matches these requests against stored files of available resources and produces the best schedule it can. Conflict analysis is provided for requested events that cannot be scheduled due to resource conflict, Cosmic said.

Besides operational and simulated scheduling and their modifications, Cans provides data retrieval and file maintenance functions, including creation of new files, adding new file entries, and altering data on existing entries.

Despite its "out-of-this-world" origins, Cans is described as a general purpose program that can be adapted to solve a wide range of non-critical path-type scheduling problems. One observer suggested that it could be used for school routing or mail delivery, just as well as for space flight control.

The program is 75% Fortran IV and 25% Assembler language, and can be ordered as program GSC-10909, from 112 Barrow Hall, University of Georgia, 30601.

Package Prints Payable Checks

NEW YORK – DOS/360 users with no more than 32K bytes of core can use an accounts payable package now available from Decision Concepts Inc. (DCI) even though the system was originally designed to operate in a 65K environment.

Payables are often one of the first accounting systems to be put on a computer and that is reason enough, DCI argues, for the new user to consider a package such as this $7,500 one instead of going through the effort and expense of developing his own.

This package is said to process all data related to cash disbursements, including the accumulation and posting of data about checks prepared manually outside the computer. The system itself is capable of generating checks, either in the same processing cycle as liability data is received, or at some later date, based on a "due-date" calculation.

Before the DCI system generates any checks, however, it prints a list of payments to be made and their anticipated due-dates, taking Into account – when applicable – discounts for timely payments. Management has an opportunity to review this list, and approve or countermand the payments planned.

In addition to accepting liability items, that is entries of invoices received from the user's suppliers, the system can handle partial payments and can apply credits against payments. This provides a flexible cost distribution and debit control for general ledger balancing.

The check generating and cost distribution functions are all based on two files. The Payee Name/address file carries data on vendors and their employees, each identified with a unique alphanumeric number.

An open items file contains all unpaid and paid liabilities, identified by a payee number.

The Cobol source code is sold outright for $7,500 which also includes 40 manhours of implementation support, DCI said from 280 Park Ave., 10017.

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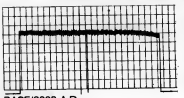
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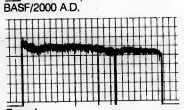
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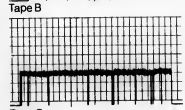
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COMPUTERWORLD
CW SPECIAL REPORT

★What's In in the World of Input★

September 27, 1972

From the Inside

What's Real Story On Replacements?

They're Limited, But...

Some reasons for moving from conventional keypunching units to shared processor key-disk systems are obvious: the sheer cost of the cards, their handling and storage or disposal can be enormous in a high-volume environment.

Another advantage is less evident to the user just beginning to survey the keypunch replacement field. But the fact that almost all the multistation systems accumulate operator workload and performance statistics may be the reason for replacing keypunches, according to Roy R. Lovelace of the National Education Association.

Objective Evaluations

Operator costs are a large part of any data entry shop budget, he noted, but supervisors find it difficult to get truly objective evaluations of operators working independently on individual keypunch machines.

On the other hand, the operator statistics (collected as a byproduct of the key-disk system's prime function) provide a good basis for supervisor action, including praise for good work that might be taken for granted without the statistical reports.

But "riding herd" on operator performance is a classic managerial function and hardly enough justification for developing a whole new breed of data entry systems configured around minicomputers.

The new systems obviously cost more than keypunch machines, or do they (when everything is considered)? What limitations do they impose, and what freedom do they allow?

What are these keypunch replacements really like?

Well, they are essentially outgrowths of earlier and still heavily used key-tape units which continued keyboarding to get data into a system, but avoided the problems associated with punched cards that were limited in size and required a special card entry run.

Each of the key-tape units had its own minireel of tape so users were no longer limited to 80-character cards, and additional cards, with new formats of 120, 93 or even 82 characters of information, were necessary for a transaction.

In some cases, the units still impose an upper limit on how long a record can be, but it is always well above the 80-character string bequested the DP community by Herman Hollerith and his card.

Eased Program Control

Even as they allowed longer records, the key-tape devices also eased the use of program control functions. In many cases operators didn't have to change program cards to start work on records with different formats, as they would when using an IBM 024, 026 or 029 keypunch.

This first-level upgrade from classic keypunching also provided built-in verification capabilities so that operators could confirm the accuracy of their keying without shifting their keyed file and their source documents to a separate machine.

So there was a potential saving, in cost and in space requirements, resulting from the more versatile key-tape units.

But the minireels also created at least one problem. Although computer-compatible, the reels were awkward in any quantity and using them directly to feed data into a computer system was often only marginally easier than loading cards.

The key-tape devices were generally stand-alone units and if several operators were preparing input for the same application, a pooling operation was needed to be performed before entering the data into the computer.

The so-called shared processor key-disk systems include most of the enhancements introduced by the key-tape devices, but go beyond them by applying the power of the mini to manage and control the input process.

Keying is still the principal vehicle for entering data, but several vendors have interfaced other peripheral units, including OCR scanners, to their systems to speed high-volume work.

The systems are not card-oriented so they again avoid the Hollerith-imposed 80-character limit on record sizes. And the programming capabilities of the mini permit an impressive amount of processing on the data even before it reaches the mainframe.

Multiple Record Formatting

This support includes the uses of multiple record formatting and editing routines, evoked on a record-by-record basis by a format-key signal from the operator. These routines can go far beyond the program control cards of conventional keypunches.

Certainly they can be used to start fields in specific record locations, and to insure, even as the data is being entered, that it is valid in format for the field, i.e. it is numeric when it should be numeric, alpha when it should be alpha. With some of the units, an unacceptable entry will lock the keyboard until the operator makes a correction.

But the software in the mini can also be used for check-digit calculations to confirm the validity of account numbers; for checking numeric values against acceptable ranges (which can be altered as conditions warrant); and for accumulation of batch or multibatch control totals.

Reports can be generated, though these would be limited by the nature of the available data to recaps of current activity, and could not include moderate or other historically based comparisons.

Pooling of data is avoided through the use of disk packs as intermediate storage of input from all the operators on the system which in some cases may have as many as 40 stations linked to one mini.

The system itself will, under software command, put all the related records, from all operators, onto a single tape for transfer to the user's mainframe for

(Continued on S/Page 2

Buffered Keypunches Mean More Power

In more and more installations, users are feeling the pressure of heavier workloads coupled with an incontestable, continuing need for preparation of punched cards. Typically, this might entail highly volatile data files that require "hard-copy" confirmation of changes made, and heavy programming commitments, with logic changes too complex to enter any way but on cards.

Conventional keypunching won't fill his need; perhaps there is no room for additional machines or no money for additional operators. The non-card-oriented alternatives are clearly inappropriate, but the new breed of buffered keypunches should do the trick.

These units have, at least in rough outline, the appearance of conventional keypunches such as the IBM 029, but they include a number of features which make them both faster and easier to use.

The most significant of these features is the one which gives these units their name. Rather than punching data directly into the card, these units place what the operator has keyed into an intermediate storage buffer.

Correct Errors

Only after the operator is satisfied that the data is correct and depresses the proper control button does the information actually get punched into the card. This means the operator can correct any keying errors before they become punched errors. And that clearly reduces the number of errors to be caught through verification runs.

IBM's Model 129 and Univac's 1701 and 1710 keypunches are

129 looks much like 029 but the buffer adds to operator capabilities.

among the buffered models now available from mainframe makers, while the 400 Series Punch-Verifier has begun to appear from the independent vendor, Tab Products Inc.

These machines have more than the use of buffers in common. They all allow more than the conventional keypunches' one format control "program" and one alternate. The Tab Products punch, for example, is said to allow as many formatting programs as the user requires, whether this is "five, 10 or 31," according to a company spokesman.

Normally the switchover from one formatting program to another has to be done manually, but the Tab units have apparently gone one step beyond the others. A Sequential Program Advance feature will shift from one formatting to another, without operator intervention, but according to user-specified sequences, as the operator punches one after another in a set of cards.

The Univac 1710 has a completely visible reading/punching station which the company notes is especially useful when working with prepunched turnaround documents into which additional data must be punched. Tab Products has included this feature on its punches as well.

The Univac 1700s and the Tab Products units are also alike in that they support verification on the same machine that does the punching of data. IBM has the Model 159 Verifier as a companion to its buffered keypunch.

Correction Punching

Coupled with their verifying capabilities, Univac and Tab Products include correction punching support. The Univac operator can slip a new card into a special entry slot to replace an erroneous card.

Repunching on the Tab equipment is said to be self-activated, working from a 10-card supply hopper and duplicating all the data on the original card up to the column in which the error was detected.

At that point, the character the operator was attempting to verify is punched into the new card and the rest of the original card is duplicated, assuming it is verified correct. The erroneous card is "flushed" into a special output stacker for disposal.

The Tab Punch-Verifier, just now starting first deliveries, appears to have another feature missing from its older competitors. The Constant Speed Drive feature moves the card through the punching cycle without stopping at each column and then continuing.

Thus it is said to operate far more quietly than other keypunches. But a spokesman was quick to note that the company did not eliminate the characteristic click of the keys as they are depressed. That particular noise seems to have a psychological effect on the operators, and they are "lost" if it isn't there, the spokesman explained.

User With Choices Benefits

It Takes Planning for a Mixed Media Environment

Many DP installations, particularly those that have just grown rather than developing according to a well-conceived plan, have realized the value of fundamentals to check out their progress and their preparation for the future.

They have all kinds of CPU power, thanks to very persuasive salesmen, but they have almost forgotten that all DP can be divided into three functions. Though the terms used will differ from one installation or application to another, everything really comes down to input, processing and output-related operations.

And of these functions, input operations have to be recognized as the most critical. GIGO (garbage in, garbage out) has become almost a platitude in data processing, but only because it so succinctly sums up real world conditions.

Processing (updating, file maintenance or whatever term applies to the middle function) can be tailored to the end-user's needs or desires, and then further refined as those needs or desires change.

Reports or output files can be reformatted in the same way until, given the correct input, the system works ideally.

What is Right Input?

That's the rub: given the right input. What is "right?"

Organized in some consistent or identifiable way, certainly, and – ideally – accurate and limited to data that is pertinent to an application, or series of related applications – that would be the DP manager's definition of "right."

The means of preparing input are not a part of either of these general definitions of the right input, but the means are often part of the functional definition of input that is right or appropriate for a specific application. Magnetic Ink Character Recognition (MICR), for example, is almost synonymous with banking.

The fact is more and more users have begun to realize they should configure their installations, including data preparation sites, away from the DP department itself, to allow more than one way to get data into the system if their budget, their hardware and their applications permit.

Some systems are limited, by central processor hardware constraints or application requirements, to a single form of input. And some budgets just cannot support additional peripherals even as they become available from more and more sources.

Choice of Devices

But the user who has a choice of input devices may benefit in several ways. He can have redundancy within an application, to protect himself against failure of the prime input stream, almost without regard to the cause of the failure.

He also gains the potential for implementing brand new applications for which his original single input device was inappropriate. The standard MICR font does not include alphabetic characters, for example, so bank DP centers have to use some other means to get name, addresses and other material into their files.

User interest in alternate input media is reflected by a growing list of peripheral units now available, at sometimes surprisingly modest prices from many sources, including mainframe and mini makers and independents.

Innovative Devices

The list of innovative devices includes magnetic tape cassette and high-speed paper tape systems for mini; 40-column card readers for IBM's S/3; and vastly improved keypunches and keypunch replacements.

Optical Character Recognition (OCR) units have dropped in price and gained in capability, and a whole range of remote batch and interactive terminals, both "dumb" and intelligent, have appeared and found acceptance.

Mark-sensing is an old input concept that seems to have gained a new life as users have apparently learned to control their handling of source documents.

Magnetic stripe card readers, graphic tablets and voice-actuated input systems have appeared, particularly in field test situations, and have done reasonably well, but with rather limited applicability to general commercial DP operations.

Backup input support, admittedly redundant, would protect the user against problems at both the data preparation sites and the I/O peripheral locations, and should be a system requirement for any time-critical applications, users in that situation would agree.

Problems at the data preparation locations may range from actual mechanical failure of the device through which the data is being readied for the computer, to failure to recognize unacceptable conditions on data that is supposed to be ready.

Smudged mark-sense documents or Detroit's voting problems with punched cards (that suffered "chad-fallout" before they could be counted) are examples of the latter type of situation.

At the I/O peripheral, input can again be stymied by machine problems: the terminal, the card reader or the OCR scanner go down.

If redundancy is the principle reason for having more than one means of input, experienced users have said, it is important to plan ahead so that identical or at least compatible operations can be followed for either input technique. With that thought, various OCR scanners can, for example, read MICR-encoded or hand-written entries.

At the user level, systems designers can include notations of appropriate keypunch columns on what are normally logs for terminal entries or hard-copy customer orders generated as by-products of paper-tape preparation.

In other words, devices generally are available for more than one entry into a system. The need for the extra support is recognized, particularly by the installations with heavily time-dependent, production-oriented workload, but it takes planning to make a meaningful mixed media environment.

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On Replacements

(Continued from S/Page1)

file updating and report generation.

Vendors have reported some direct linkups between their shared processor data entry systems and the user's mainframe so that even the disk-to-tape cycle is eliminated.

On the other side on the mini processor, at least one vendor has put his input station in the field where the data is originally collected or generated. This vendor has used an input station that was already in place: the Touch-Tone telephone.

This telephone support, if combined with a mini-to-mainframe link, would bridge the gap between keypunch/keypunch replacement systems and direct entry systems.

Reader's Digest Multifaceted Approach Has 142 Stations for Key-Disk Units

The input section handling "fulfillment" or subscription processing work for *Reader's Digest* is an example of how and when a user should turn to multiple, mixed data entry systems to get a job done on a timely basis, and to provide backup in the case of problems on any of the input streams.

The *Digest* is not only big enough to afford this multifaceted approach, but it is big enough to require it, and to bring the system up in an orderly fashion.

Shared Systems

The magazine uses three large shared processor key-disk systems, but it took six months to bring the first one up to "acceptable" status. The system also utilizes two types of optical scanning (OCR) equipment for bulk work, according to systems engineer Paul Sidikman of the *Digest*.

In addition, the section also has "some" (perhaps as many as 20) conventional keypunch machines for programmers and others who still need cards, he said.

The *Digest's* accounting department, he noted, also uses keypunches for its work which is less cumbersome than the work done under "fulfillment."

Citing the *Digest's* shared processor key-disk systems as "large" is an understatement. Some users have as few as eight keying stations on their systems; the *Digest* has a total of 142 stations linked to its three Logic Corp. systems. These may, in time, be extended to the 168 stations that are the theoretical combined maximum, Sidikman indicated.

Several Problems

The first of these systems was installed in August last year and both the magazine and Logic Corp. anticipated a long acceptance period. All the software was customized and there were problems as the programs were polished. There were also some minor hardware problems with the system, based on a 2311-type disk as a collection media.

Tuning System

Two or three months were spent in tuning the system, Sidikman said, before the magazine could test it with long production projects. But the wait was apparently worthwhile; the tests showed that the magazine could expect somewhat over a 10% productivity increase at each station, on the average, compared to classic keypunching, Sidikman claimed.

Actual increases vary by application, the *Digest* spokesman noted, and range from as high as 25% for easy entry jobs on which the systems can take over some of the operator's chores, to no improvement at all for other jobs.

Turnaround documents (bills and the like) with simple change of address yield very high productivity increases on the mini-based systems, he said, whereas there's no gain on subscriber letters with instructions written in the margins, since these are "operator-limited."

"There's not a piece of equipment in the world" that will help the operator in that situation since she spends so little of her time actually keying, Sidikman added gloomily.

Easier Now

The long shakedown of the first system paid off nicely when the second 2311-based system was installed earlier this year. It required no significant time for acceptance tests. And the testing of the latest system, utilizing 2314-type disk support, has been simplified because of what Logic and the magazine learned in the earlier tests.

The bulk of the turnaround documents returned during major promotions ("you may have already won . . .") is processed through a Scan Optics 2020 stand-alone OCR reader or an IBM 1287 scanner linked to a 360/40, with another 1287-360/40 activated during peak periods.

Scanner Function

As much as 75% of the returns can be handled by the scanners with the remainder, usually involving address changes or other reader-added notations, going through the key entry systems.

Sidikman's section is responsible for order entry, payment entry, complaint handling, change of address, returns and the "whole gamut" of magazine, book and other product fulfillment applications. The optical scanning equipment allows the handling of 12,000 document/hr compared to something like 100/hr through the key entry system.

The 142 keying stations are centralized in one area at the *Digest*, unlike some installations that put stations in several input areas that may be submitting work.

The choice was deliberate, Sidikman said, and it was based on the belief that most clerks are either highly trained typists or highly trained "whatever-they-do" in their respective sections. They may know exactly what must be included in a transaction · destined for the computer, but be at a loss on a keyboard.

V
6
1
3
9

S
F

XU


CHARGE
49832
TOTAL
WEEK TOTAL

MON TUE
3.5 2
2.0 4
8.0 8

CMC 160 Keystation

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How to Get Those Operators: In-House, Outside or 'Veteran'

While there is a multitude of input devices available today and the choice of the most appropriate might be considered difficult for a given installation, that decision is somewhat facilitated by "candidates" with certain, specified capabilities which the user can match to his current or future needs.

But as in almost all DP work, the actual input process involves more than just machines. Even in those situations where data collection systems are said to run "unattended," there has to be someone to periodically monitor the system operation. And even more obviously, all the keypunches, keypunch replacement systems and intelligent terminals require operators to reap the benefits of their capabilities.

Where do these operators come from? They certainly aren't mass-produced in the same way as the units they control. Are there any general techniques used by large DP installations, or by professional training organizations, that might be overlooked by the smaller user?

Training Confusion

In fact, a spot check with users of various sizes suggests a confused "state of the art" in training of input operators. There is general agreement that typing skill is a good prerequisite for other keyboarding skills. But after that there is little agreement on anything.

The problem, it appears, is that training involves very personal interaction between trainee and trainer, in any case, the training activity produces results which are very hard to quantify.

This truism means that management often has a hard time trying to decide whether to conduct training in-house, to get outside help to do the training or to hire only experienced operators.

Those three approaches can in fact be matched with some justification to the size of the user's overall operation. The larger the company, apparently, the more likely it is to have in-house training.

On the other hand, some of the larger, perhaps more prideful companies have suggested that they don't have to hire anyone except experienced operators. Paradoxically, the really small user sites often have the same rule, but for a totally different reason.

Again going back to the uncertainty of the training process results, they feel that available money is better spent directly on salaries for trained operators, rather than on salaries and other indirect costs related to a training function which may or may not work out in the end.

Economy Problem

The overall economic situation has also affected operator training programs. During the past two-and-a-half years, the job market has tightened so much that operators are staying put. The need to train new operators and to get them used to a company's way of doing things has just disappeared for some installations.

That is the situation at General Foods, according to training supervisor George Tutein. When asked about his company's training program for operators, he had to try to remember what the company was doing two-and-a-half years ago, when it was able to drop the program, as employee turnover stopped.

That may be the exception, but the whole world of operator training seems to be made up of exceptions.

An independent data entry preparation business in New York City, Commonwealth Data Services, follows an approach very much like the old sink-or-swim routine. Potential operators are screened for reasonable attitude and typing skill. After that they are briefed on the workings of the keypunch, the requirements of some simple job and told to go to it.

This sounds harsh, Commonwealth's Patsy Harris admitted, but it seems to work. The girls that are going to catch on, do. The girls that won't, don't.

As the operators gain in speed and accuracy, Commonwealth rewards them with salary increases. Since the firm is Black-run and operates in Harlem where there is much unemployment, fatter paychecks are a tremendous motivation, Harris noted. The operators are able to buy things their neighbors can't. That is far more important than fancy working conditions she added.

The company, however, uses CMC-5 and Four Phase shared-processor key-disk systems as well as Univac keypunches, and the clustered working keystations do provide the operators a psychological boost, Harris said.

Operators feel a sense of pride in working with key-tape devices and key-disk systems, agreed Ann Conte, New England training director for Mohawk Data Systems. But she also noted that experienced keypunchers can be confused when they first encounter the new machines.

The operators are so used to seeing results of their keying on cards, they have a hard time really accepting the fact that the data is now being stored on magnetic tape or disk where they can't see it.

The ability to verify records with the same machine on which they were recorded and to make corrections without having to recreate entire records are similarly difficult for some operators to accept, Conte noted.

Two days of training and exposure to the features of the single-station key-tape units are usually enough to make experienced operators comfortable with those devices, she said. Untrained typists should have a day or two more.

To get users up and running on the multiple-station shared-processor key-disk systems, Conte's group spends two days working with the people who will be supervising the operations. Then the newly trained supervisors run the sessions for the operators, with the Mohawk staff available only as information resources.

In contrast to the independent keypunch replacement vendors, IBM provides no training – even in unbundled classes – for users newly acquiring 029 or 129 keypunches. The users have to find their own way, as far as the leading supplier of keypunches is concerned.

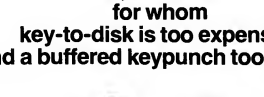
Elaborate Programs

Users with large keypunching operations (John Hancock Mutual Life, for example) have set up elaborate and often very effective training programs in-house. Smaller users sometimes farm out their trainees to technical schools in their area.

This can be an expensive proposition, as Sperry & Hutchinson discovered. S&H, the Green Stamp people, has a DP training section, but coordinator Gail Buerger didn't have facilities available when she was asked to train some new operators.

Ten were enrolled in outside courses, at company expense, but not all completed the course. Of those that did, not all came back to work for S&H.

For the 40,000 users for whom key-to-disk is too expensive and a buffered keypunch too limited:



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On-Site Operator Training Makes for More Security

Some users are finding themselves with a real need for more skillful data entry operators but without the internal resources to prepare and present solid training programs of their own. These companies tend to seek the help of outside firms that specialize in keyboard training. And they generally appear to be satisfied with the results.

Increased productivity of the operator appears to be the most objective measure of how well these professional training organizations function. And tests conducted by various users, including the U.S. Navy, indicate that the improvement may be anywhere from 15% to 35%, averaging about 22% more keystroke/hr after the training than before.

Most machine vendors will introduce the supervisors and operators to the features of the equipment, but will spend little if any time working with the user on day-to-day operating procedures. This is one area where the professional keyboarding trainers score very high marks.

Visit User Site

Almost without exception, the trainers come to the user's site, and work with the user's actual production applications. This immediately eliminates the sense of being in a foreign environment and for the trainee avoids working with perhaps technically sound, but not directly applicable "case studies."

The in-house approach has one other very real benefit as far as management is concerned. The operators are immediately available in case of need, and aren't in some centralized "education center" miles away.

Having the training done on-site was certainly one of the reasons Union Carbide Corp. called on Keyboard Training Inc. (KTI) for help, when the conglomerate moved from New York City to Tarrytown, N.Y., according to Jim Gear, Carbide's director of data entry.

JONES Mrs. Mary	IBM 029	6,900	4.3%	BEFORE TRAINING	9,150	0.5%	PREVIOUS EXPERIENCE APPLICATION APTITUDE ACCURACY ADAPTABILITY GENERAL
		10,120	0.11%	AFTER TRAINING	13,875	0.2%	Mrs. Jones worked extremely well on the course and achieved very pleasing results. Her alpha error rate had to be greatly reduced and this was done by initially reducing her speed then once her error rate was pulled her speed gradually built up. Mrs. Jones achieved a very good all round improvement in her performance and it is felt that with experience she will make an excellent operator.
BROWN Miss Linde	IBM 029	10,650	0.98%	BEFORE TRAINING	14,210	0.87%	PREVIOUS EXPERIENCE APPLICATION APTITUDE ACCURACY ADAPTABILITY GENERAL
		15,840	0.17%	AFTER TRAINING	18,590	0.3%	A quiet young lady who worked well, has good concentration and application, Miss Brown achieved good results on the course. She did well to reduce her high error rate and to increase her speeds so markedly. Miss Brown is a competent operator and an asset to the company.

SPEEDS SHOWN ARE KEY DEPRESSIONS PER HOUR • AN AVERAGE BASED ON A NUMBER OF TESTS

Keyboard Training Inc. Report

While in the city, Gear had a policy of hiring only experienced keypunch operators, and there were enough around to supply his needs. But most stayed behind when the company headquarters was moved up the Hudson River and Gear had to find a way to train local operators locally.

He has somewhat mixed feelings about his experience with KTI. The connection between Carbide and KTI started with an "evaluation" of Gear's operators by KTI which, despite its cost, "didn't really tell us anything we didn't know about the girls already."

The training itself was much more satisfactory, however. Working on IBM 029 keypunches, KTI provided the equivalent of three weeks training for each of 20 girls, all with less than a year's experience. Some of the trainees were in a sense "re-trainees," Gear said, since they were very recent graduates of keypunching schools. They had more trouble "unlearning" bad habits than in finally picking up the good ones, he noted.

All of the Union Carbide trainees had to have at least some typing skill. From that base, KTI worked on such elements as proper posture and good hand positions to avoid fatigue and to reduce needless hand movements.

'Gypsies at Heart'

Gear, whose installation now includes four 129s, some Univac 1710s and 1701s and a CMC-9 shared processor key-disk system with 13 keystations, considers the training worthwhile, despite the fact that "keypunch operators are gypsies at heart."

As with several other users who had turned to professional trainers, Gear gave credit for the success of the training more to the individual instructor than to the company he represented.

The allegiance of a user to an instructor rather than to the company he represents in fact played a part in the decision by Michael Stonehouse, Carbide's instructor, to split off and form his own company.

Part of the gain in productivity and the user's willingness to give credit to the individual instructor rather than his company, are based on a quirk in human nature. Industrial psychologists found out long ago that workers (operators) react well to any new stimulus, if they are satisfied that the change is being made for their benefit.

But potentially more important than psychological impacts and reemphasis on "proper" mechanical operation of the machines, the trainers say, is their ability to help the user recognize weaknesses when they exist in his operating procedures. In preparing his lesson plans, the instructor has to know the rationale behind the design of a source document or the record being keyed.

Once he knows the user's thinking, he may be able to make suggestions for improving the workflow, based on his broad-based experience with the particular machine or application. The alternate programming feature is one mechanical feature that is "badly underutilized" in many keypunch installations, one instructor noted.

Here's a display terminal you can rack mount, or desk-top, or remote keyboard. How convenient!

It's the LSI 7700A, available in three configurations to fit all OEM requirements or end user applications. But if you think the packaging is convenient, just look inside.

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Keypunch Replacement Shipments Expected to Increase This Year

Keypunching onto cards is still the most popular way to get data into DP systems, but the picture is changing.

Keypunch replacements, with the user keying directly onto a magnetic media (tape or disk), are gaining wider acceptance, and direct entry units are "by far the fastest growing" segment of the input device market, according to International Data Corp., a market research firm.

Keypunches, both conventional and the newer buffered models, lead the pack in terms of both installed base (250,000 units) and number of units shipped last year (29,000). As a class, keypunch replacements form the second largest installed base (58,600 units) and second largest number of units shipped last year (10,800).

The rate of shipments for the keypunch replacements is expected to increase this year, IDC said, while the rate of keypunch shipments will show no change from 1971 levels. OCR is expected to show a 30% shipment growth this year, and the rest of the "direct entry" segment will have comparable expansion, the study said.

Confirming this shift from keypunching, a study by the Association of Data Processing Service Organizations (Adapso) shows that only 50% of the service companies surveyed had keypunch units in 1971, whereas 60% of them had the same kind of equipment a year earlier.

In the same time frame, Adapso noted, key-tape/disk users increased from 8% to 16% of the companies, and users of terminals jumped from 20% to 34%.

In its study, IDC found that direct entry devices, including teletypewriters, CRT and "intelligent" terminals, industrial data collection systems and "some" OCR scanners, are limited to the "most sophisticated" sites, but are becoming more widespread as users begin to develop distributed DP networks, the company said.

Keypunch replacement equipment is primarily used in high-volume, batch-oriented systems. In any of its forms, it offers economy and flexibility over conventional keypunching, IDC noted.

Many key-to-tape units link a single keying station to its own magnetic tape unit, and the cost justification is a very direct calculation. For a shared processor key-to-disk system to be practical, the researchers said, it must replace five or more keypunches.

Some small OCR systems might be practical for the same users, IDC said, noting that there are about 15,000 computer sites with that number of keypunches or with comparable input volume.

Don Leavitt

About the Author

This supplement was prepared by *CW* Software Editor Don Leavitt, who has been responsible for the Software/Services section of the newspaper since March 1970.

Leavitt entered data processing in 1962 as a programmer trainee for a major utility. Since then he has worked as a programmer and systems analyst in banking, manufacturing and service bureau environments.

IRS Training Program Unusual, But Similar to Other Systems

The U.S. Internal Revenue Service has some unusual data entry needs, and what may be equally unusual ways of training its personnel. Yet for all its apparent uniqueness, the IRS program has several elements in common with other training systems.

The tax people have a highly cyclical workload, typified perhaps by the Andover, Mass., regional center which handles the returns for taxpayers from the entire northeastern U.S. This office has a permanent data entry staff of 160, but uses as many as 1,100 during the spring filing period.

Not Simply Keypunch

The IRS doesn't use keypunches or keypunch replacements, in the usual sense of the word. To cut the entry job down to a manageable size, the service uses GE 760 Datanet terminals feeding directly into a GE (now Honeywell) 4020 mainframe. This doubtless speeds the work, but means that the training can't be pure and simple keypunch-oriented sessions.

While the IRS work to be done is cyclical and based on a "different" input device, it is probably more repetitive than in any other data entry installation. It is naturally geared almost without exception to processing individual Form 1040 tax returns.

This is a big advantage for the IRS trainers, according to Paul Anthony, chief of the Data Conversion Branch at the Andover regional office. As long as the IRS can train people to handle the tax returns, it has solved its problem, he noted.

Each year, during the slack seasons, each of the IRS regional offices offers training to any qualified applicant who can pass a Civil Service examination and type at least 20 "good" word/min, Anthony said. He said that IRS dropped the typing prerequisite one year, but had a terrible time in the training cycle and in staffing afterwards.

So in expecting at least a reasonable typing skill as a starting point, IRS is no different from most other data entry training environments.

The training program itself is coordinated by the IRS national office to ensure uniformity. Each of the regional offices is responsible for the development and maintenance of a section of the overall training program.

The Austin, Texas, office did the work on the individual tax return program for new operators. It is a 40-hour system that utilizes computer-assisted instruction (CAI), audio tape cassettes and head phones as well as more conventional textbooks and drill and practice on the terminals.

Test Cases

The book provides the basic fundamentals of data entry but then goes into the procedures behind the tax form. Used with the audio cassette, the booklet sets up test cases, and these will occasionally have built-in errors so that trainees can learn to cope with unexpected problems.

Each trainee must spend at least 40 hours on the program. Beyond that, each "student" must pass any three out of five tests given during the training period.

With the CAI support, the IRS instructors can maintain complete records on every trainee, even in his day-to-day practice work. This means, Anthony noted, that patterns of errors, if they exist, can be identified and corrected before the trainee completes the course.

Even though each trainee can work at his own speed, the IRS groups the trainees into classes of about 32 so that common issues can be clarified without needless repetition of instructions. Currently between 160 and 320 people are being trained at Andover, Anthony estimated.

Of these typically about 50% will pass and ultimately 50% of that group will be hired by IRS, he said.

"That's right. Even though they have to be processed as prospective employees before they start the course, the trainees are not employees. They aren't paid while they're taking the course. On the other hand," he added, "they aren't charged for the instruction they get, either."

Additional Training

Because of yearly changes in the processing of tax returns, IRS provides an additional 24-hour training session for newly hired trainees and for rehired part-timers who work only during the rush season. This refresher course, again created by the Austin, Texas, regional office and again utilizing CAI, will be used by 150 to 200 workers this coming year, Anthony said.

Another 24-hour training package was utilized, he added, when IRS went from keypunch to direct data entry a few years ago. It was the only way the service could ensure that the conversion would be made uniformly in all 10 regional offices, he concluded.

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Film Strips, Perceptiscopes...

Hancock In-House Program Supported by Many Aids

John Hancock Mutual Life Insurance Co. has a massive keypunch production department and – either because of, or despite that – the company has developed its own rather demanding and extensive in-house training program for new operators.

Candidates from within the company or outside it face a minimum of 60 hours of classroom work related to the IBM 029 keypunch, if they can pass the required typing proficiency test. They must be able to type 35 word/min with no more than five errors, according to Karen Keep of the Career Development Program of Hancock's education department.

Classes are limited to seven trainees which is enough to meet company needs and still allow instructors to give individualized attention to students, she noted.

The Hancock keypunch curriculum sounds conventional enough. It starts with concepts of coded data and machine familiarization, before moving into drill and practice on numeric work.

Training Aids

But the otherwise standard training pattern is supported by various training aids that lift it out of the ordinary. Every teacher at the Hancock, for example, is a certified instructor.

The teachers utilize film strips of the Perceptual Development Laboratory series from Sight and Sound Inc., Norwalk, Conn., to reinforce the classroom and textbook topics.

And they use a Perceptiscope to flash numbers on a screen just enough to be understood. This statistiscope-like device forces the trainees to work their keyboards automatically, without really thinking – and much faster than they would if left to their own untrained reaction times, Keep noted.

The trainees are eligible to go on to the next phase – alphabetics – only if they can pass a test on numerics with less than 10% error rates. And they can't move from straight alpha work to alphanumerics until they pass still another checkpoint test with the same quality level.

Once the basic training is behind them, the Hancock students begin work on niceties needed to get production work done quickly and accurately: such things as zero-filling, and right- or left-justifying of fields depending on data types or special instructions. They start to get coaching on how production work is handled in a real work environment.

Once they add the concepts of alternate program control for their keypunches, and some practice in using control cards with alternate programs, they are given real assignments, working with an application that is no longer in production. This not only gives the trainees a sense of real work, but it protects the company against inadvertently putting trainee-punched cards into actual production runs, Keep noted.

During this part of their training, the neophyte keypunch operators are clocked by the hour, and by the end of the training cycle they are expected to be consistently producing at least 200 card/hr with no more than 5% error. Thus, over the period of the training, the required volume has gone up while the acceptable error rate has been cut in half.

Trainees who are already Hancock employees from some other department generally spend 10 seven-and-a-half hour days in the training, "with time out for lunch, of course," Keep noted. But Hancock has another source of new keypunch operators who follow a different schedule to gain the same level of training.

The company runs classes for qualified candidates while they are still attending high schools around the city. These student trainees must be "highly recommended" by their schools, and Hancock often has to select the seven best of a larger number of prospects.

They take most of their training during their Christmas vacation and during the weeks that all Massachusetts public schools have off during February and April. They complete the training work in the afternoon, from 3 p.m. to 6 p.m.

While in training, the high schoolers are Hancock employees paid by the hour. There is an understanding, Keep said, that they will become regular part-time employees when their training is finished, and they can become full-time employees as soon as they graduate from high school.

With this type of program, Hancock is not only developing its own personnel reservoir, but it is clearly providing a real work experience to at least a few students in the city high schools' business curriculum.

Terminal Device, Striped Card-It's All Here

Many systems designers feel they should arrive at a sensible, effective implementation that is easy to use, secure from tampering by the user and error-free for the sake of the DP staff.

In some applications, these may be just hoped-for goals, but when the system that is being designed is intended to give out money at unattended teller locations, the system better achieve those goals and, if possible, surpass them.

This was the problem faced by the Burroughs Corp. design team that put together the Remote Teller (RT) "terminal" device and the user's magnetic striped card to make it work. The two items have to work in combination or the whole idea of unattended banking fails.

As the firm says in a handout describing how the problem has been attacked, "a considerable amount of study has been, and is being done, to produce the 'forgproof' cash/credit card." The attack utilizes two techniques: encryption and "secure card property."

Unique Number

Some of the data recorded on the card's magnetic stripe account numbers – for checking or for credit line, and bank transit and routing numbers – will be static for the life of the card. By combining some of this unchanging data with a set of random numbers stored in the CPU linked to the RT terminal, the system produces a unique number.

This unique number serves as a basis for the encrypting of some of the more sensitive data on the magnetic stripe. Second, Burroughs explained, it is used to generate the personnel number, which the

(Continued on 5/Page 20)

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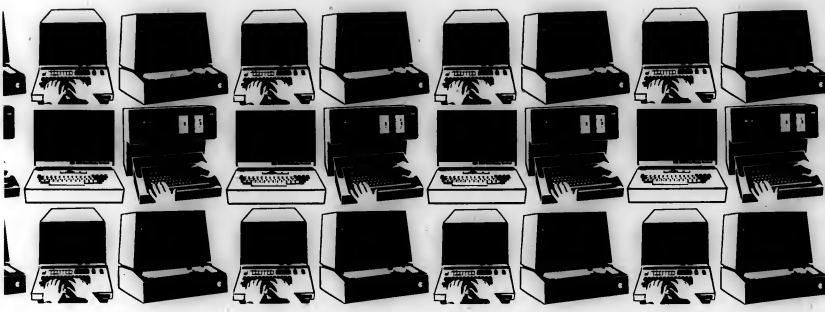

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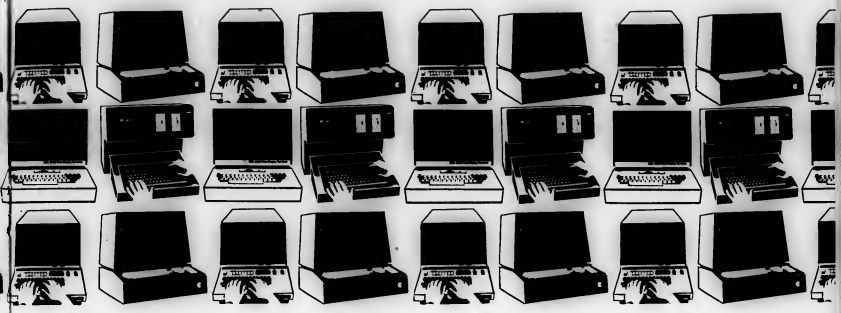

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Software Gap May Be Retarding Use of Programmable Terminals

Many devices can be used with one or another of the mini-based "intelligent" terminals currently available, but only one – a cassette read/write mechanism – appears to be indispensable to the intelligent user. The cassette unit was the one peripheral always mentioned in every city on the *Computerworld* Computer Caravan last spring.

Sometimes it was just one of several add-on devices, but it was there. Even though John Johnson of the Farr Co. told the Los Angeles forum his installation used terminals equipped with CRTs and hard-copy printers, he said it also had the cassettes to capture for later processing.

The CRTs allowed the data to be entered almost as quickly as with direct entry or key-tape devices, he said, but beyond that they support the hard-copy printing of sales, purchase and manufacturing orders generated overnight at a separate data center.

The data from the cassettes is transferred to a standard half-inch magnetic tape for transportation to the data center, and from the wider tape to the cassettes when it returns for the final processing or printing steps.

The shift to standard tape is done at least in part, to allow the data to be taken to a different data center if the normal one is unavailable.

Panelists at other caravan stops also compared the speed of the intelligent terminal as an entry device to the speed of direct entry units. Edward Scott of the U.S. Department of Justice told the Washington, D.C., forum that the terminals were about 80% as fast as on-line direct entry, but at greatly reduced cost.

The terminals generally did not provide as much editing as a direct link to a mainframe, but they are "a good compromise," he noted. Training people to use them, however, might be a problem, he indicated.

The problem arises if the trainer assumes the operator is anything but stupid. This approach may sound rather drastic, but it should prevent the instructor from omitting anything.

Omissions happen when the teacher assumes that "everyone knows that." Assume the trainee knows nothing, and the instructor has to provide every bit of information, and don't leave out the "obvious" parts that "everyone knows" may be the rule.

Dr. Dick Simons of Texas A&M said there really is no excuse for using conventional keypunching when an intelligent terminal "effectively costs less." The only thing blocking wider use of the programmable units is a very definite software gap.

The gap exists primarily for those users who want to use the terminals for more than just data entry, since that basic application is often provided by the terminal vendors, Simons said.

Unfortunately the mini-makers were dependent on the OEM market so long that they are just now beginning to make good end-user type software available, he explained.

Closely matching Simon's comments in time and certainly confirming their accuracy, Sycor's Terminal Application Language, released this summer, and other vendor products show comparable moves.

The Chicago Caravan stop, in fact, heard from a Sycor user, Richard Allen, director of MIS at Con Agra Inc., who tagged the units as an "evolutionary" step between keypunch and direct entry.

He noted that transactions recorded at his company's remote sites are batched on cassettes for later data transmission to a centralized terminal where it is transferred to standard tape for mainframe processing.

Beck in Boston at the initial caravan stop, Robert Chernis of Lumber Mutual Life agreed that the cassette-based terminals allowed the user to move responsibility for data preparation out of the the computer department into other areas of the firm.

By preparing cassettes in the using departments, he said, a firm can eliminate errors. The users are more familiar with their application and with their data requirements than the DP department would be.

Though enthusiastic about the intelligent terminal's potential, Chernis warned the workshop that users had to consider very carefully the reliability of the equipment.

Chernis' arguments – to get the data entry operation out in the using department – is in interesting contrast to the thoughts of Paul Sidikman of *Readers Digest*.

In planning his keypunch replacement operation, Sidikman felt that yes, the users did know their transactions and documents best, but no, that didn't mean they were also good keyboarders.

So he has his user departments complete the necessary documents and his centralized crew keys the data into the system through a shared processor key-disk system or scans it into the system through an OCR system.

Burroughs Uses Striped Card

(Continued from S/Page 17)

authorized user will be given when the card is issued.

This number is the key to authorized use of the RT system. If the personnel number entered by the user doesn't match the personnel number as calculated from the card, the terminal will not honor the user's transaction.

Various credit card systems have user-entered numbers to approve authority for card use, but Burroughs seems to have gone a step further by basing the number on a series of random numbers within the CPU, which the bank manager may change when he feels the security of the system has been compromised.

Obviously, such a change would entail notification of all the legitimate cardholders of their new "secret" number, and this clerical effort by itself would dampen the manager's interest in changing the numbers without due cause.

Burroughs recognizes "it could be possible" to duplicate an existing card and if the personnel number is known, duplicated cards could be used to fraudulently obtain cash. So the system has a "derogatory file" technique built in to severely limit this possibility.

The card includes dynamic data showing (magnetically) the number of uses permitted in any day or within a specified period; the number of uses remaining in the same time frames; and the date last used.

The count fields are decreased each time the card is used, and if they reach zero before the start of a new day or a new period, the cash request would not be honored.

The "number of uses remaining" fields are reset to the appropriate amount at the proper intervals, but meanwhile the account cannot be dribbled away by careful fraudulent use of the card.

The secure card property involves the physical creation and makeup of the magnetic stripes themselves. With the Burroughs techniques, each card's stripes are different, and these differences can be sensed by the terminal even if they cannot be seen by man.

There are in fact three stripes on the Burroughs card. Two are the "standard" airline and bank credit lines, the third holds the Burroughs RT data.

OCR's Cost, Capabilities Scare Some Users Away

Optical reading of source documents is a concept full of promise for users trying to gain control of massive input volumes, particularly data essentially repetitive in nature. But something happened between the development of the concept and its application by a large number of users.

The concept is great. Working directly with source documents should allow users to bypass completely the classic problems of error-prone transcribing of information into some computer-readable form. It should save both time and expense in getting data ready for DP application.

The equipment currently available covers a broad range of capabilities all intended to implement at least part of the concept behind optical reading. Where the appropriate equipment for the job is installed properly, it performs well and the users are happy.

If that's all true, why hasn't the industry turned the corner; why is OCR still a very clever, very effective input media for some users (but impractical for most) and not the ultimate and sensible alternative to classic keypunching? Industry sources point to several distinct problem areas.

Some vendors have made genuine efforts to produce reasonably priced equipment, but most is so expensive that it is prohibitive for many installations. This may well be the hardnosed, basic reason the installed base of readers and scanners hasn't increased to any great degree in the past two years.

Beyond that, the capabilities appear to be so incredible that they may have scared some users away. The speed with which some of the equipment is supposed to handle input is greater than many users need – they don't need a Ferrari when a Toyota will do.

Speed isn't the only confusing capability; some potential users have said. They must decide whether they should opt for document readers, which read one line of input from a card, or page readers, which extract extensive amounts of data from sheets up to and beyond the size of conventional typing paper.

The document readers have a simpler job to do, so their makeup is also simpler than the page readers. But they are limited in the amount of data they can bring into the system from each document.

The page readers, on the other hand, are often touted as being able to handle a mix of different-sized pages, so that the user apparently can design his forms to suit any requirements he has beyond the scanner.

Unfortunately, this versatility does not always stand the test of actual usage and scanners have jammed and misread as a result of trying to work with an assortment of page sizes in a single input run.

How to Prepare Documents

Even more frustrating is the whole question of how to prepare the original source documents. There are three basic forms of units, mark readers, bar-code readers, and character readers.

The mark readers are the simplest of the three but the crudest in terms of how the data is shown on the original source documents.

In some cases, for example, users are expected to set down data in Hollerith code, but with a pencil instead of a keypunch as the transcription tool. This works reasonably well with numeric data but can be extremely awkward when coding alphabetics.

Bar codes are likewise simple for optical reading equipment designers to handle, but hard on the users. The codes may be shadings of the black-grey-white spectrum or special patterns or large and small dots.

They are not really human-readable and generally require special encoding equipment, so they tend to violate the concepts of optical reading even while they form part of the current scene.

By contrast, the fonts bandied by character readers are clearly intended for human as well as machine interpretation. The only problem is that the DP community has yet to settle on a single font so vendors can work toward that without feeling as they apparently do now, that they must accommodate any font the user wishes.

There are especially two fonts designed specifically for optical readers. OCR-A consists of highly stylized, very angular capital letters, numerics and special characters. Presumably because it is a limited character set, without a repetition of the alpha characters in a lower-case form, it is easier to read and appears to be the favorite of the U.S. vendors.

OCR-B, on the other hand, consists of both upper- and lower-case letters, and numbers and special characters. This makes it both easier for humans to read, and harder for machines. This font has found favor with the European Computer Manufacturers' Association and is an Ecma standard.

Some readers are built to handle more than one font, and even to be able to "learn" new fonts as a need arises. And some readers are built as stand-alone mini-based units while others serve as peripherals units linked directly with a full-sized computer system.

Overall, in the eyes of some observers, the optical reader industry has hurt itself and (paradoxically) failed to provide the user with a technology he can easily utilize, by trying to be too accommodating.

Too many choices in this case apparently have led to a wait-and-see attitude from some installations that could benefit from the capabilities now available.

Before Creating Substitute Document Better Check With Submitting Bank

Many users design their installations to provide backup for all critical functions including input, and this generally works out well. But there have been instances in which the availability of alternate input means has created rather than solved problems.

One such case involved a computer center that provided DP services for a dozen widespread commercial banks.

Applications offered by Teuton Data Center (not its true name) included demand deposit accounting (DDA), or checking account processing. Normal entry into DDA at Teuton, as at most banking installations, was through an MICR reader/sorter.

Teuton had a good MICR reader but neither it nor the actual MICR encoding on the checks being sent to the center was in perfect condition all the time.

When the reader failed to read a check, the center punched a substitute document and got into the system through a card-entry run. This approach was appreciated by the banks since it kept the system running smoothly.

Too smoothly.

Teuton's manager got a call from one of its banks. One of its customers, the bank said, had received his monthly statement and was curious, to say the least, about several of the checks charged to his account.

The checks had not been issued by him, the customer said. He admitted they looked like the other checks but he was adamant. They weren't his checks and shouldn't have been charged to his account.

Closer study of the checks showed they were made out to different persons but all for exactly the same amount, $99.23. And they were all supposedly from the customer's payroll account.

Except for the payee names, they looked like absolute copies of one another. And that indeed is what they were: photo-offset copies of some legitimate payroll check issued in the past, with the payee and issue date blanked out before the reproductions were made.

Over a period of weeks these gems were completed and presented for payment at any of several bank branches, and always on Friday afternoon when tellers were swamped with long lines of people. The amount was under $100 so the tellers cashed them without bothering to check the identification of the person presenting the checks.

The branch bank encoded the amount in MICR ink and batched the check with others for processing. When it reached Teuton, it was rejected by the MICR run since the bank and account numbers in the MICR strip along the bottom of the check were not, despite appearances, encoded with magnetic ink and could not be read and checked by the reader.

No matter. The check had been accepted by the bank so a substitute was punched and put into the DDA system through the card run. The check was charged to the customer's account and the system continued on its way.

Once the situation was fully understood, tellers were alerted to watch for $99.23 payroll checks from the customer and to check identity carefully. And the bank or banks that had cashed the bad checks reimbursed the customer.

At the same time, Teuton warned its input clerks not to make substitute documents for any of the fraudulent checks that did get into the system.

Instead the bank was notified that a phony check had been found, batch totals were corrected to maintain dollar control over the valid input and the $99.23 check was turned over to the police.

No one really blamed Teuton for making a substitute document when the original had been accepted by the bank, but without that backup card entry run the false checks might have been recognized before they got charged against the customer's account.

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Between Intelligent and Dumb Terminals There Lies 'Teachable' Units for One Job

- Multiple-Voice Input Systems
- Scanners Can Be Taught to Read Fonts

There is a good indication of the existence and likely growth of a class of terminals that are neither "intelligent" – by virtue of a minicomputer through which they can be programmed to do many things – nor "dumb" – because they can only accept one type of input and pass it along to a mainframe for processing.

Somewhere between these extremes, perhaps, are what might be called "teachable" terminals that are generally set up to do one type of work, if not just one specific job. But these devices can be taught to accept a different form of input and the teaching can often be done at execution time.

Multiple-Voice Unit

A fairly current, and potentially very exciting example of this equipment is the multiple-voice input system demonstrated last May by Threshold Technology Inc.

Because Threshold's system can accept verbal input and convert it into useful internally stored data, it is already pushing the state of the art in source automation.

But this system goes further. It can accept input from virtually any operator, if it can match the voice coming into the system with a stored recording of a particular operator's voice.

Potentially the system can have a vocabulary of 100 words, Threshold claimed, but the prototype was limited to 21 words. These were recorded by each operator on a separate audio cassette loaded into the terminal whenever that operator uses the device.

In preparing the cassette, each operator is required to repeat the digits and words of the vocabulary 10 times, so the terminal can catch any slight differences in giving the words from time to time.

It takes about 10 seconds to train the system once the cassette has been loaded into the terminal, the company said. After that, if the terminal can match a spoken word to a stored one, a panel with the word on it is lit up on the terminal.

If the word cannot be understood by the system, a "beep" sounds and the transaction entry halts until the operator restates the word or otherwise bypasses the problem.

On command the prototype, which is designed for a grocery store, will total the purchases that have been recorded, calculate any taxes, accept an indication of how much was offered in payment and tell the clerk how much change, if any, is due.

Accuracy in matching the spoken word to the recorded one is as high as 99% in laboratory tests, the company said, so field tests have begun.

The system appears to be useful in most places except where extraneous noise would confuse the matching procedure.

Because each user will have different basic vocabulary needs, the units will have to be virtually custom-made, Threshold said.

Somewhat less spectacular than the voice input system, but perhaps more useful where there must be a source document anyway, are some of the OCR readers that can be "taught" to read various type fonts.

Several of the scanners have this capability; it apparently worked well in Scan-Data's models 250 and 350 and seems likely to be part of the company's currently anticipated new product announcement.

Where Threshold used audio cassettes to teach its system the operators' voices, Scan-Data's 250/350 uses a sheet of paper with samples of the desired font on it, one character per row across the page.

The operator "tells" the scanner the next sheet to be input is a learning sheet. He may also indicate acceptance limits so deviations from the ideal, as represented by the learning sheet, can be accepted.

The character set and the limits are controlled by the Software Aided Multi-font Input (Swami) software system which then prepares the internal tests needed to process the anticipated input in the new font.

The ability to state acceptance levels is probably most important when the font

The Scan-Plex operator keys in a correction to a rejected character shown on the on-line display. Video images of the non-recognizable character are shown in context.

being introduced is a handwritten one, a company spokesman suggested, since the human is less consistent in his work than any machine.

The Scan-Data system can accept not only varied means of expressing English, but is "perfectly happy" to accept documents in any font, up to and including the Japanese Katakani, provided a learning sheet can be prepared before the work is processed.

Despite the latitude permitted by the operator-defined limits of acceptance, some characters – especially in hand-written input – are still rejected. To cope with that problem, Scan-Data can add another feature to its Swami-supported scanners.

Utilizing the Scan-Plex feature, documents are scanned, and the correctly recognized characters, as well as video images of rejects, are written onto a disk. The video images of rejects are in context; the characters to both the right and left of the reject are stored with it.

Rejected Characters Displayed

When the Scan-Plex operator is ready to correct the non-recognizable characters from a batch or job, that file is retrieved from the disk and the rejected characters, still in context, are displayed on a CRT unit in front of the operator's keyboard.

Once the operator keys in the correct character for the reject, the data is put on magnetic tape and is ready for further processing as soon as all the corrections have been made.

This feature allows the basic scanning to proceed at full speed, the company said, and gives the operator everything she needs to make the corrections at optimum speed, so the next processing will not be unnecessarily delayed.

Better Hardware Spurs Graphics Terminal Rise

Graphics terminals, particularly cathode ray tube (CRT)-based devices, have become increasingly important to growing numbers of users in the past five years and the trend will continue – probably at a faster rate – during the next 10 years, according to two recent studies.

Better hardware implementations, which have cut the cost of the units dramatically even while improving their performance, were cited for the devices' climb in popularity since 1967, in a discussion of the history of the units by Carl Machover of Information Displays Inc., a vendor in the field.

On the other hand, dollar value of the installed user base will jump tenfold in the next decade, despite an anticipated reduction of 60% in the cost of the average graphics terminal console, according to Thomas G. Hagen and Robert H. Stotz of Adage Inc., another vendor.

Looking Back . . .

Looking back, Machover noted that in 1967 "most" graphics terminals consisted of a display generator with digital logic and some analog functions, and a "refreshed" CRT. Only one unit used a storage tube at that time, and only two included their own computers, he said.

Now, however, because of the sharp break in the cost of minicomputers, many "intelligent" (i.e., mini-based) systems are on the market today.

In addition, a set of quantitative measures of the units' capabilities, based on manufacturer-supplied data and devised by the *Computer Display Review*, tended to give the development work a direction and, in a sense, a standard, he said.

Tektronix's introduction of the Model 611 CRT marked the start of a parade of storage tube-based terminals that did not require "refreshing" of the display.

These simple devices broke a cost barrier for CRTs. Originally in the $12,000 to $15,000 range, they now sell for under $8,000 in many cases.

Use of "long persistance" phosphors which increase the flicker-free data content of refreshed displays has begun only in the past three years or so, he said.

In the same time, span, vendors have begun to handle some of the picture manipulation and curve generation functions through hardware, instead of requiring the user to program them, which would provide slower, more error-prone processing.

Both the light pen and the keyboard have continued as the predominant input devices for graphics terminals, but since the light pen cannot be used with storage tube displays, Machover noted, "much attention" has been directed to the development of a lower-cost graphic tablet.

There are in fact already two or three versions of such devices commercially available, he said.

In addition to identifying the technical improvements since 1967, Machover also pointed to numerous articles in industry journals, and the establishment of a special interest group for graphics within the Association for Computing Machinery as indicative of a matured user concern for the units.

Continuing from that base, Hagen and Stotz said application areas including situation display, data analysis and computer-aided design (CAD) have already proven cost-effective.

The areas most likely to be at least explored in the next decade will include computer-assisted instruction (CAI) in education and management information systems (MIS) in industry.

In interactive computer graphics, they concluded, DP users are at the "end of the beginning." About $50 million have been invested in the products now on the market and another $20 million to $40 million have been spent on software development.

Most of the systems now installed were ordered, in the authors' view, as "interesting but risky and somewhat daring experiments."

By contrast, in the past year graphics systems have begun to be ordered to do specific jobs, with "reasonable certainty" that they will prove effective in those tasks. Thus, Hagen and Stotz believe, an important corner has been turned.

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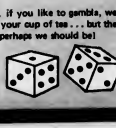

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Data Briefs

APL Character Set Added To Model 38 Teletype

SKOKIE, Ill. – Teletype Corp. has added an APL character set to its Model 38 teletypewriter. In addition to the usual APL characters, the Teletype set includes three new characters – a diamond, right tack and left tack.

The Model 38 prints the 88 APL character set, the three new characters and those Ascii characters which are dollar sign, open brace and close brace, according to the company. The terminal also features an on-line backspace capability which allows it to print APL overstrike characters.

The Model 38 KSR with APL costs $1,228 and the ASR unit costs $1,465. The APL set adds $35 to the price of the terminal, a spokesman said. First deliveries are scheduled for early next year. Teletype is at 5555 Touhy, 60076.

Sonex Data Set Offers Versatility

HUNTINGDON VALLEY, Pa. – Sonex Inc., has introduced the 302 Autotone data set which is compatible with Bell 403D and 403E units.

Designed for automatic answer and data transmission between a remote Touch-Tone terminal and a computer or other data terminals, the 302 Autotone interfaces directly with the Bell CBT data access arrangement, and provides up to 12 automatic answer multifrequency data receivers.

The 302 costs about $6,600 for a 12-channel unit. The firm is at 2337 Philmont Ave., 19006.

Portacom Terminal Price Cut

STAMFORD, Conn. – The Telecommunications Division of Data Products Corp. has reduced the price of its Portacom portable terminal.

The 10 char./sec teleprinter will now sell for $1,695 compared with a previous price of $2,550. The terminal is TTY compatible and transmits data via a built-in acoustic coupler. The firm is at 17 Amelia Place, 06904.

Simulator Aids Error Correction

PROVIDENCE, R.I. – International Data Sciences, Inc. has an addition to its line of automatic data error-correction systems. The Validata 9150 modem/channel simulator injects random errors into both the transmitted and/or the received data in any synchronous data communication system.

The error rate is selected individually per channel by two error-rate switches and the desired noise density is also selected. The 9150 is available in 30 days for $1,440. Lease-purchase plans are available.

The firm is at 100 Nashua St., 02904.

Stanford Picks a CRT

Choosing Terminal? Check the Ballots

By Ronald A. Frank
Of the CW Staff

STANFORD, Calif. – The selection of a terminal device that will interact with a computer/communications system is important, but often the choice is unfairly limited to equipment known to the user.

An objective search for the optimal terminal is often too time consuming for the average user. Recent evaluations performed by Stanford University to select a CRT for its Bibliographic Automation of Large Library Operations Using a Time-Sharing System (Ballots) may provide some help.

Ballots is an on-line interactive system, run on an IBM 360/67, that supports the acquisition and cataloging functions required by the Stanford libraries. The CRT selected had to perform bibliographic functions such as searching, ordering and modifying data related to stored publications.

The selection process began with a review of the terminal's desired function, and a related specification was developed. The specification was modified to distinguish between required features and desirable but not mandatory features, according to Hank Epstein, Ballots director.

Eight final requirements included: compatibility with the Stanford hardware/software environment, which included interfacing with the PDP-11 which would act as the CRT front-end; usefulness for other applications at the Stanford computation center; asynchronous 9,600 bit/sec block mode communications support; uppper- and lower-case character support; full editing capabilities including cursor controls and insert/delete features for both characters and lines; 1,000-char. minimun display; field protect features and some method to handle data overflow; and it had to be reliable at an "affordable" price, Epstein said.

Most Eliminated

Available information was gathered by word of mouth, technical literature, vendor's specifications, consultant's reports, etc. on available CRTs that seemed promising. The vendor's specifications for the product were compared with the Ballots specifications. These comparisons eliminated most of the unacceptable equipment.

The list of potentially acceptable equipment included about 20 models from 15 manufacturers. Wherever possible, discussion were held with existing users and vendors were asked to leave a CRT on site for a trial period.

The MOS/LSI technology available led the university to consider a programmable or intelligent system because they provided the capability to tailor the CRT operations to the application and also provide the capability to absorb data overflow and field-expansion problems.

Choice of Three

The choice of terminals was eventually narrowed to three programmable CRT systems. A more extensive analysis of system A, B and C was then undertaken. A table comparing terminal characteristics was drawn up.

The table had eight categories and a box to give a rating of -, 0, or + for the categories: processor, memory size, display size, character set, configurations, communications, service and reliability.

Comments were evaluated in the processor category: two of the systems were full programmable MOS/LSI while System C was hardwired MOS with a "one-time programmable ROM."

But despite the hardwired feature, System C had a 350-nsec processor which was faster than the 6.6 μsec for System B and 1.9 μsec for System A.

Some discrepancies were discovered in the display size category. System A had a screen capacity of 1,152 characters arranged in 24 lines by 48 columns, while System C also had the same character capacity, but was arranged on the screen in 32 lines by 80 columns.

System B displayed 1,920 characters in a 24-line by 80-column arrangement. The available character set varied from 96 upper- and lower-case characters to 124 among the three systems.

For reliability all three systems were marked as "unknown." Two vendors had prototypes in the field. In one case it was noted that the vendor had "withdrawn" a previous terminal.

A final chart was made comparing the projected availability and delivery dates of each system. As a result of the total evaluation, the Ballots selection committee headed by Wayne Davison selected the Sanders 804 terminal system to fit its unique requirements.

Phone Call-Scheduling System Can Be Adapted to Handle Data

HOUSTON – Texas Instruments has a computer-controlled telephone call-scheduling system that can "significantly improve telephone line utilization," according to the supplier. While initially designed for voice traffic, the system's software could be adapted to handle data, a spokesman said.

Called the LDC system, it contains a TI 960A minicomputer with about 12K memory, a TI 979 magnetic tape transport, a Diablo disk, a Cognitronics voice-response system, a TI "Silent" 700 printer and an Ann Arbor CRT terminal.

The LDC system is offered on a turnkey basis tailored to handle the user's telephone system. PBX or Centrex systems can be controlled and zoned Wats, measured Wats and regular long-distance phone services can be controlled, monitored and analyzed.

The mini-based system automatically records call information, user identification and called number. But its greatest asset is said to be in optimizing the traffic volume to allow a greater amount of outgoing calls.

An LDC 1 system would cost about $2,500/mo including software support and installation on a turnkey basis.

In addition to monitoring and scheduling call traffic, the LDC system generates magnetic tape records of calls handled which can be analyzed by users to make changes in their system. The tapes can be processed on an IBM 360/370 system, a TI spokesman said.

Based on traffic analysis, the LDC system could pinpoint optimal hours to place calls to certain area codes, and it could determine when circuits to certain geographic areas were overcrowded and additional lines should be added.

First shipments of the LDC system are expected in about three months.

Voice-Response, Mini Linked

ANN ARBOR, Mich. – Interface Systems Inc. has developed a low-cost voice-response system to interface with a DEC PDP-11 or other mini. With remote Touch-Tone phones, the S-11 voice-response system can be used to configure a mini-based remote input communications system, the company said.

The S-11 system connects directly to the PDP-11 Unibus and IBM 360/370 channel interfaces will also be available. Multiple channels can be accommodated, and with the addition of a multiplexing capability, multiple telephones can be connected to the system.

The response system is based on a synthesizer that uses 55 phonemes for a vocabulary of up to 500 words. Software is included with the system to enable the user to modify his vocabulary.

In a communications configuration, the S-11 operates with Bell 403 or equivalent data sets.

A typical system will be priced "below $4,000," according to a spokesman and first deliveries are scheduled for early 1973 from the firm at 5 Research Drive, 48013.

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Bits & Pieces

Disk System Matches 2314 But at Price of 2310

RED BANK, N.J. – A new large disk system with the capacity of a 2314 but at the price of a 2310 is being offered by Diva Inc.

The $12,500 cost of the DD-14 system is about one third the cost of a similar facility from the major mini manufacturers, according to the firm.

The DD-14 has a capacity of 29M bytes, or about five times that of the 2310/5440 it is designed to replace. Transfer rate is 312 byte/sec and the access time is 35 msec. An optional feature of the DD-14 allows complete interchange of disk packs between mini systems and 360/370 systems. The DD-14 is available from 59 Maple Ave., 07701.

Sigmas Communicate

ANAHEIM, Calif. – A High-Speed Data Channel (HSDC) for direct memory communications between Xerox Sigma 5 and 7 computers and external subsystems is available from Code Research Corp.

Complete interface, including both hardware and software is offered. Additionally, full documentation is available for Sigma users wishing to implement their own HSDC installation, from 170 E. Liberty Ave., 92801.

PDP/11 Interfaces New Peripherals

FORT WORTH, Texas – A new product line from Avcon Inc. allows PDP/11 users to interface with the Tri-Data PD20 magnetic tape unit, the Centronics M-200 card reader, the Ann Arbor CRT Display A2T206 and the Pertec D3000 series disk drives.

This new capability will allow PDP/11 owners greater flexibility in choosing system configurations and allow reduced system cost, the firm stated.

The Interface Series consists of an I/O Adapter for $925 and a choice of two Interrupt Generators (a 16-level-model for $1,200 and a 32-level model for $1,600). Delivery is from 1330 Summit Ave., 76102.

Mini System Costs Under $5,000

NEWTON, Mass. – A new plug-to-plug interface connects the Ross Controls Model 1111 cassette recorder to an Automation Alpha and Naked Mini 16-bit and 8-bit computer and forms a complete minicomputer system with 4K of core for less than $5,000.

Single unit price for the Model 1111 and interface is $1,275. A dual deck-drive costs $2,275 and a triple-deck costs $3,200. Delivery is from four to six weeks from 383 Elliot St., 02164.

Aluminum File Units Cost $122

CAMBRIDGE, Mass. – A new series of aluminum drawers is available from Cambridge Thermionic Corp. for use in their Cambion 194-in. card files. The initial unit, priced at $122, is available from 445 Concord Ave., 02138.

Independent Boxes Cut Electric Bill

By Ronald A. Frank
Of the CW Staff

Users of the first independent add-on memories for the 370/155s may find a savings bonus in their electric bill.

"IBM core memory units draw 4 kVolt-Ampere (kVA) per 512K bytes on the 155," according to one independent memory supplier. "Our 2M byte configuration with more advanced core on the 155 draws about the same power," the spokesman said.

While it is hard to translate the actual power savings into dollars, they could be significant. "We feel a 155 user with our memory in a 2M-byte configuration could save up to $200/mo," a spokesman for one vendor said.

The exact power consumption of a 155 system varies depending on the particular mainframe operation, according to IBM. "The 512K-byte memory will draw 2.5 kVA when it is not being addressed, but it will draw 4.5 kVA when it is being addressed," an IBM spokesman said. For a 2M-byte IBM 155 system, the power consumption would be 12 kVA when the memory is being addressed, the spokesman added.

One independent supplier of 155 and 165 add-on memories has combined the lower power requirements with the lessened BTU cooling load on air-conditioning systems to come up with some significant figures. Fabritek compared the IBM 3360 Model 5 memory for the 155 with its own equivalent.

Because of the variation in power rates the comparison was made at both 1.5 cent and 5 cent/kW for an M-byte mainframe. The savings would be $132/mo at the lower electric rate and $440/mo at the higher rate. On a 4M byte mainframe the savings would jump to $250/mo at the lower electric rate and $820/mo at the higher rate, Fabritek said.

While there may be savings, the figures will probably be somewhat lower, according to a utility. Based on a 75% power consumption drop (from 16 kVA with IBM's 2M byte to 4 kVA with a similar independent box), a spokesman for Boston Edison estimated the savings would probably range from $25/mo to $75/mo depending on the total electric usage of the customer. But the lessened air conditioning would add to this, he said.

Some additional "fallout" savings could also be involved in lower air-conditioning requirements. "If the user is drawing less power in his mainframe, he will require less air-conditioning to keep his installation at the specified temperature," one installation expert said.

Exact monthly savings are difficult to estimate. Cambridge Memories is just beginning to ship its 155 add-on memories, and Fabritek expects to install its first box on a 155 late this year, and the 165 units early in 1973.

Typically the independents are talking about a "25% to 40% cost savings" to the user on the price of the core memories. If current estimates are correct, the customer may reap some additional savings from a reduced monthly electric bill.

English System Speeds Drafting

PLAINVIEW, N.Y. – A new British hardware/software digitizing system allows on-line verification and interactive editing for automatic drafting machines.

The Ferranti Interactive Freedraft System, available in the U.S. and Europe, includes digitizer, graphics display, programming support and "normally" a small computer.

The Freescan digitizer works on an electromagnetic system of position measurement, with no mechanical moving parts, enabling the operator to follow complex curves or irregular shapes smoothly to an accuracy of five-thousandths of an inch, Ferranti claimed.

Features repeatedly can be digitized and stored in a macro library as complete definitions, to be recalled by an identification procedure. Transformation routines permit macros to be shifted, scaled, rotated or mirror-imaged.

Automated Drafting System

Prices are presently not available, Ferranti said, because of the variables in the required software and minicomputer components. The U.S. office is at E. Bethpage Road, 11803.

Manual Data Transfer Cut With HP Punch

PALO ALTO, Calif. – A new tape punch from Hewlett-Packard can eliminate the need for manual data transfer. The Model 3489A can be connected to measuring instruments with TTL-level or BCD-coded outputs. Using the flexible formatting facilities, data entered off-line on the punched tape is fed directly into a computer or calculator for analysis.

Unattended operation is possible with the built-in interval timer, a spokesman said. Sampling rate is controlled by the data punch rather than the measuring instrument. The punch can be set to sample a measurement at defined intervals.

Codes Handled

The 3489A accepts up to eight BCD digits of measurement data plus one digit for range, one BCD digit for function and one bit for polarity and overload. Punched data format and character codes can be programmed on a pin board. Codes that can be handled include Ebcdic, Ascii/ISO, Standard BCD and CCITT No. 2

Punch speed for the 3489A is 70 char./sec. Any code up to eight bits can be programmed, along with special format characters.

Price of the Model 3489A is $3,000, and delivery is from stock at 1601 California Ave., 94304.

Tape Unit Costs Under $8,000

PALO ALTO, Calif. – Minicomputer users can utilize a magnetic tape system for less than $8,000 from Precision Instrument Co (PI).

The PI system includes a 1400 digital magnetic tape recorder, computer interface, formatting electronics and a complete software package.

Dual-density 800/1,600 bit/in. read/write electronics are standard. The 7-channel model has 200, 556 or 800 bit/in. electronics (choice of two). The 9-channel recorder interfaces in either 800 bit/in. NRZI or 1,600 bit/in. phase-encoded mode. Standard tape speeds are 12.5, 25, 37.5 and 45 in./sec.

The 1400 hardware/software interface allows users to integrate the tape system with minis including the DEC PDP-8, 9, 11, 12 and 15; Data General Nova and Supernova, Hewlett-Packard 2100 series; Varian 620 series; and others, according to the firm.

The system is available from 3170 Porter Drive, 94304.

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Virtual Storage Hardware Mechanics Spelled Out

By John Hunter and Dan Tanner
Special to Computerworld

The virtual storage capability for the models 135, 145, 155 and 165 is made possible by inclusion of three system enhancements: Extended Control (EC) mode, Dynamic Address Translations (DAT) and Channel Indirect Addressing.

This part of the series attempts to explain the impact of the IBM virtual storage announcement on users' hardware and software

EC mode provides an extended format for the processor's program status word (PSW), thereby gaining control over several System/370 functions unavailable in the previously used basic control mode.

DAT provides an automatic two-level address translation and mapping process that utilizes page and segment tables to yield an effective storage address span of 16M bytes.

Channel Indirect Data Addressing allows a single channel control word (CCW) to span several pages in noncontiguous real storage during I/O data transmissions.

For each CCW that potentially spans a page boundary, the channel control program will automatically generate an indirect address list.

These enhancements are provided free to model 135 and 145 users, but cost $200,000 and $400,000 respectively for models 155 and 165.

Peripheral Enhancements

IBM has essentially retained its current range of direct access devices, i.e., 2311/2314/2319-type disks, the 3330 disks and the 2305 drum (which was once a disk). All can be used to provide virtual storage, although the 2314-type disks offer lower performance than the 3330; the 2305 is likely to be used only in large systems where performance is a prime consideration.

IBM's disks have been the subject of competitive pressure from independent peripheral manufacturers. For the 2314 type, IBM had earlier moved against this trend by offering an integrated control for them on the models 135 and 145.

Virtual storage, however, means faster disks; thus an increased demand for 3330 disk subsystems is anticipated.

Specifically, the 3330 disk subsystem has been changed in several ways: first, the interface between control and drives has been changed, distributing some electronics into the drives.

Secondly, there are now integrated controls for 3330 disk subsystems, analogous to those for 2314-type disks on models 135 and 145; these new controls

Virtual Storage Part II

are available for models 135, 145, 158 and 168 but not for models 155 and 165.

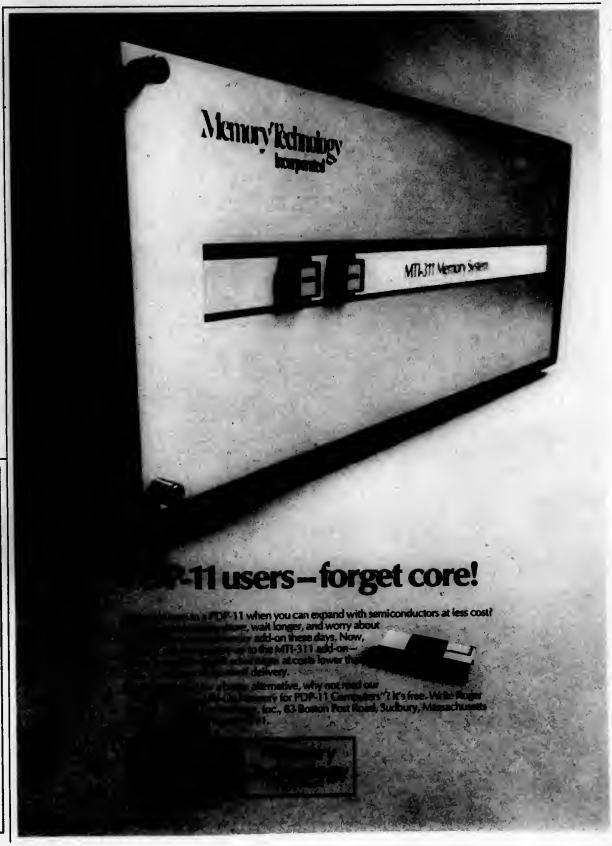
Thirdly, increased numbers of disk drives per control (be it integrated or stand-alone) are allowed – 16 on a Model 135 IFA, Model 145 ISC or 3830 Model 2 Storage Control; 32 on a Model 158 or 168 ISC.

The former 3830 control is now redesignated the 3830-1; the new 3830-2 connects up to two subsystems, each composed of one 3333 dual-spindle drive and up to three 3330 dual-spindle drives, giving a configuration functionally the same but with the internal electronics distributed differently; some of the logic has been moved from the 3830 to the new 3333. The 3830-1 Storage Control is being discontinued, effective Oct. 31, 1972.

A 3330 disk subsystem can now connect to a System/370 either via a channel, as previously, or else via a new optional integrated control, removing the need for a 3830 on models 135, 145, 158 and 168.

The authors are associate editors with Auerbach Computer Technology Reports.

This series is taken from a detailed study of IBM's Advanced Memory, available from Auerbach Inc., 121 N. Broad St., Philadelphia, Pa. 19107.



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*SOURCE: International Data Corp. (IDC), an independent computer industry research firm.

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Seminar time, each city: 9 AM to Noon. Lunch follows.

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Registration: Registration must be made in advance, but may be made up to the time of the seminar, subject to confirmation. Telephone registrations will be accepted.

Fee: The entire fee for the seminar, including lunch and pre-lunch refreshments, is $25 per person.

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COMPUTER INDUSTRY

CI Notes

Bubble Memory Delivered

ANAHEIM, Calif. – First delivery of a magnetic domain bubble memory has been made to the Air Force by the North American Rockwell Corp.'s Electronics Group.

The memory consists of a 64-bit shift register, with data control and magneto-resistive detection, driven from a programmable memory exerciser. Demonstrations indicate the device can provide NDRO, non-volatile memory with a capacity over 10^6 bits and the ability to synchronize data flow between sensors and data processor or transmitters, the firm said.

IBM Borrowing Upsets Bankers

TOKYO – A $300 million borrowing by IBM World Trade Corp. from Japanese banks was mentioned as a source of complaints from bankers in New York, London and elsewhere which prompted the Bank of Japan and the Japanese Finance Ministry to caution Japanese commercial bankers against lending foreign currency, especially U.S. dollars, at cut rate prices.

The bankers said IBM didn't have to pay a syndication fee for the loan, which was at an "exceptionally competitive rate."

IBM countered there was no syndication fee because the loan was arranged through 12 Japanese banks, and the rate was one half a percentage point above the interbank rate in London.

DEC Forms Industrial Group

MAYNARD, Mass. – Digital Equipment Corp. has formed an Industrial Products Group (IPG) to unify marketing efforts for its industrial control and computer products.

Digital's new IPG will market PDP-14 and PDP-14L programmable controllers, K-Series solid-state modules and the Idacs-8 and Idacs-11 industrial data acquisition and control systems based on the PDP-8 and PDP-11 minicomputers.

Supershorts

Computer Automation, Inc. has appointed Trsnchant Electronique of Paris as its exclusive sales and distribution agency in France and selected countries in North Africa.

– – –

Honeywell's French-developed and produced Series 50 computers have passed the mark of over 3,000 shipped or on order, Chairman James H. Binger revealed.

– – –

Infonational, Inc., formerly Boothe Data Systems, Inc., has obtained marketing rights to Computer Machinery Corp.'s Dataprint System to the direct mail industry.

– – –

AM Associates, Inc. has agreed to represent Iomec Inc. in New England.

Wescon, IEEE on West Coast

Shows See Upbeat Mood

By E. Drake Lundell Jr.
Of the CW Staff

LOS ANGELES – Both the business and technical mood were upbeat at the Wescon conference here last week and the IEEE Computer Society's annual conference a week earlier in San Francisco.

At Wescon, business was brisk, even though the number of exhibitors was relatively static at 530 booths compared with last year. The attendance, however, estimated at around 25,000, was up from last year.

But while the total number of exhibitors remained stable over the past two years, there was a drop in the number of computer-related firms displaying at the show and a small dip in the number of test equipment makers employing minicomputers.

Most of the exhibitors, both in the computer area and other areas, reported doing a good amount of business at the show and reaching good contacts.

New Products

New product announcements, though, were at a minimum with Digital Equipment Corp. the only computer related exhibitor launching a new product – the TU60 digital tape cassette transport.

The big technical items at both shows were discussions of parallel-processing systems such as the Illiac-IV, Star, Staran, the Advanced Scientific Computer and the Parallel Element Processing Ensemble (Pepe) getting good play at both shows.

Interest was also shown in the memory area with both shows devoting a significant part of their technical sessions to designing memory systems with semiconductors and magnetic bubbles.

The attendance at the technical sessions of both shows – IEEE drew 700, about 15% ahead of last year – was up from the shows a year ago, indicating to some observers that computer engineers are beginning to think in terms of implementing some of the recent technical advances in the components business into new subsystems and systems.

This attitude – that designers are now looking ahead to new products incorporating recent technical advances – goes along with the selling mood on the Wescon floor (IEEE gave up exhibits two years ago).

"This show has been good to us," one minicomputer maker said. "We weren't sure it would be the right environment, but we are seeing the type of people we want to see in the OEM side of the business," he added.

"We're seeing more people ready to buy equipment," a manufacturer of minicomputer-based test equipment said. "That could be a sign that many of the manufacturers are gearing up for larger production capacities and need test equipment to handle the load," he added.

Japanese visitors to Wescon check out the Recortec cassette tape loader.

Fred Newman of Computer Automation outlines features of the firm's Naked mini to Alan Ferrill of General Dynamics.

Ampex Reorganizes Units; Computer Products, Tape Now Separate Entities

MARINA DEL REY, Calif. – The bankers have forced the expected at Ampex – the firm has moved its computer products business here and the magnetic tape divisions into new corporations.

The stock of both operations is pledged as collateral for loans received by the firm from the Wells Fargo, Chase Manhattan and other banks and there are no present plans to sell stock in the Ampex Computer Products Corp. to the public, officials indicated.

The rumor had been rumored for several months, as the financially troubled firm sought new loans and credit extensions. Pledging the stock in the new profitable operations appears to meet this need for now, observers said.

Eugene Prince is now vice-president and general manager of the Computer Products Division, but the firm has not announced the new management structure.

370s Making Sizeable Inroads Into Installed 360 Base--IDC

By E. Drake Lundell Jr.
Of the CW Staff

NEWTON, Mass. – The 360 environment continues to become more and more obsolete as the days and the new announcements march on, according to International Data Corp., which recently completed a study of the migration trends between IBM 360 and 370 equipment.

This is the first of a series of articles exploring the effect of user migration from IBM 360 to 370 equipment on various segments of the computer community.

Future articles will deal with the effect of the migration patterns on leasing companies, independent peripheral equipment manufacturers, used computer equipment dealers and other areas of the business.

The market research firm based here predicts that by year-end 1975 there will be nearly 10,000 System 370s installed as replacements for aging 360s in the U.S. computer market alone.

That figure would represent a nine-fold increase over the 1,000 370 systems installed at the end of 1971, the firm noted.

During this time IBM's domestic installed base will grow at about 15%, the firm said, spurred mainly by the 370 line. IBM's share of the overall computer market domestically will remain about the same or slightly increase, the firm added.

By the end of 1975, IDC "estimates the number of 360/30s, 40s, 50s and 65s – the most vulnerable of the 360s headed for 370 replacements – will dwindle from close to 11,000 systems in use at year-end 1971 to a mere 4,395."

In terms of dollar value figured in the original purchase price of the IBM gear the drop will be even more significant, according to the firm.

At year-end 1971, the firm said the installed value of 30s, 40s, 50s and 65s was nearly $11 billion.

But by the end of 1972, after just 18 months of 370 shipments, the value of the installed 360 equipment slid by more than 28% to $7.7 billion.

By the end of 1975, the firm forecast that 360 equipment still in use will have a value of only $4.4 billion.

But while the number of 360s will drop 31% during 1972 and another 20% from the end of 1972 through 1973, IDC said most of this early attrition would come from the IBM rental base, "characterized by machines and users which can quickly switch from one computer to another."

IBM's rental base for 30s through 65s was estimated at just over 5,700 at the end of 1971 and by the end of 1972 this base will be cut in half to around 2,400 machines in use, IDC estimated.

By year-end 1973, the firm added, the base will have been halfed again to a mere 1,200 machines in use.

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Applications Outlined

Magnetic Bubbles Place Seen Between Core and Disks

By E. Drake Lundell Jr.
Of the CW Staff

LOS ANGELES – Magnetic bubble memories will take their place in memory system hierarchies between a computer's main memory and the disk storage systems, according to William Mavity of North American Rockwell's Electronics Group.

"Asynchronous operation and a hundred-fold reduction in access time are the most exciting attributes that magnetic bubbles bring to mass data storage of handling media," he told a Wescon session here last week.

"The ability to operate under the control of external clocking, the capability to operate at any speed, stop for any length of time, and reverse the direction of data flow, coupled with significant reductions in data access time, results in a powerful product for computer architects to implement in the mid and late 70s," Mavity added.

But while the magnetic bubble technology has many favorable attributes, Mavity said "the final proof of the technology's usefulness depends on an appropriate application where the phenomena can be reduced to hardware."

The applications of the bubbles will come in two main areas, he said, data storage and data-handling categories.

Attributes Outlined

Like competing technologies such as drums, tapes and disks – bubbles have the attributes of nonvolatility which assures that loss of data does not occur during the power control transients or power loss. In addition, bubble circuits have a non-destructive readout, he noted.

The bubbles have two other distinct advantages over the competing technologies, he added.

"First, the bubble devices, both media and controlling elements, are composed of passive crystalline structure and passive etched depositions. Heuristically one can be assured that the required processing is of a simpler nature than that required for semiconductors."

The second major feature is the asynchronous operation which "is the most unique feature that the magnetic bubble brings to data storage and data-handling equipment."

This feature allows the bubble devices to operate from external synchronization. "Thus, the user may create his own timing," he said.

"The individual functions – reading, writing and annihilating are independent of one another and can be implemented in any arbitrary order. The mutual independence of functions and data rates allows the user to operate magnetic bubble devices to optimize the performance required for his particular applications," he said.

The data storage area of applications will call for the greatest volume of bubble materials, he said. "The most obvious market for the implementation of magnetic bubbles in data storage is one where the bubble will be directly substituted for an already established medium such as drums, disks or tapes.

CW at Wescon

"Reliability will be the primary consideration in introducing bubbles into these areas. Eliminated will be head crashes, problems due to mechanical inertia and tolerances, and wear in the data media itself."

Cost Considerations

As the production of bubbles and bubble materials increases, Mavity predicted cost reductions would also be a consideration in choosing bubbles over other competitors.

"Head-per-track disks and drums in the commercial and military markets . . . are the primary candidates for substitution," he predicted.

But in addition to the substitution markets, the use of bubble technology will create an entirely new market.

"The Fast Access Memory (FAM) will be a new member of the storage hierarchy made possible through the use of magnetic bubbles," he said.

"This memory's greatest attributes are a hundred-fold improvement in access time through the use of the major-minor loop device design and the ability to instantaneously stop and wait due to an inertialess media. The FAM will be a byte or word parallel peripheral, operating at byte or word rates equivalent to present day bit rates," he said.

In addition, he said, magnetic bubbles would be used in minicomputer applications as on-line storage in conjunction with core or semiconductor random-access memory in the mainframe.

"Magnetic bubbles on a card plugging directly into the mainframe chassis can be readily predicted," he added.

Other storage applications seen at the present, he said, include tape recorder replacements in satellites to enhance reliability and increase capacity while minimizing power and weight, and special push-down list memories to make recently referenced data immediately available.

In the area of data handling, "pattern processing, data switching and special-purpose logic appear to be primary uses of the bubbles," he said.

Work in bubble logic has shown that all the normal logic functions, including ANDs, ORs, flip-flops, cross-over and replicators, indicate "that it is quite possible that bubbles will have distinct computing applications."

But while the data-handling applications for bubbles may be intriguing," their main contribution to making the technology economically successful is difficult to assess," he stated.

"The business future of magnetic bubbles lies in data storage and high-volume data handling."

The initial bubble products on the market "will contain devices composed of multiplexed chips of 10K to 100K bits each, with data rates of 100 kbaud and device data rates of 400 kbaud," he predicted.

Australian University DP Purchases Aided

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CANBERRA, Australia – University purchases of computer equipment are expected to rise significantly here during the 1973-75 period.

During 1970-72, federal and state governments allocated over $2 million for universities to buy computer equipment. In the next three years, they will allow each university to decide for itself the level of equipment funds to be spent on computers.

The Government has allocated a total of over $45 million in equipment grants for the universities. Each university in every state will decide how the funds are to be divided between medical, scientific, computing and other equipment.

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DP Nets Avoid Standardization Hangups, Wide Use May Hinge on Social Issues

By a CW Staff Writer

LOS ANGELES – Computer networks offer a viable method for interconnecting incompatible systems thereby allowing resources to be shared by a wide range of users without having to be standardized, except for a common set of interface conventions for hardware, programs and data.

But the problems with privacy and other social issues will be the controlling factor in determining whether or not such networks will be widely used, panelists agreed at a Wescon session here last week.

According to G.D. Cole of System Development Corp., in the past, "standardization of hardware and software systems has been advocated as a solution to these incompatibility problems, but has not been viable in the past nor does it appear to be in the near future."

This incompatibility makes the computer community face the "conflicting desires" of continuing the development of hardware-software systems in an unfettered technological environment, "while at the same time being able to utilize each others' developments without extensive reprogramming efforts."

Computer networks overcome some of these problems and allow "the user community to share other resources such as data bases, large computing power facilities or specialized hardware systems and in some cases to provide load sharing and back-up reliability."

The "spirit of cooperative and cumulative development" needed to design such networks has been particularly evident in the Advanced Research Project Agency network, he said.

The Arpa network, agreed John Heafner of the USC Information Sciences Institute, can serve as an 'example for large-scale resource-sharing systems of the future.

CW at Wescon

More research, however, needs to be done before these networks come into widespread use – research in such areas as mass file technology, encryption techniques, intercontinental networking, common terminal devices, microprogrammable subnet components and fault-detecting and self-correcting hardware.

Socially Desirable

The computer utility is definitely feasible, he stated, but asked, "is it socially desirable?"

He noted that some elements of society see the widespread use of such systems as deepening the gap between different levels in society with "those on the lower economic scale not being offered information in a usable form at a cost they can easily bear."

"Privacy of information is another area of continuing concern. . . Existing laws and technical means for protection of that information (on individuals) against unauthorized access are inadequate. Furthermore, there is little or no legal foundation for providing for penalties for deliberate or accidental disclosure of private data."

The weakest link in the chain "appears in the communication facilities, where little work on security has been done in areas outside government use," he charged.

"There is a need for a basis from which to construct protection mechanisms," he said, and noted that professional licensing standards have been suggested as a foundation "around which to build adequate safeguards and develop penalties for violation."

In another area he noted the growth of networks could be held back by Federal Communications Commission regulatory and tariff actions. He also stated there was a need for tariffs that considered what equipment was used on the lines instead of just connect time, since data equipment generally operated in short bursts.

"The FCC appears to be taking steps in the right direction," he said.

But he warned: "The problems, however, are enormously complex and there is no question but that the social, political and legal problems (rather than the technical ones) will delay the coming of the computer utility."

Allan Syphard of North American Rockwell demonstrates the firm's SOS (silicon-on-sapphire) diode array to Elvan Young.

CW Photos by J. Drake Lonsdale Jr.

Visitors examine Versatec 1100A electrostatic printer.

Mini to Figure in Test Set Design

LOS ANGELES – New communications equipment offerings and service offerings from Bell and the specialized common carriers will call for increasingly sophisticated communications test equipment and designers of such equipment should start thinking about minicomputer-based systems, panelists at a Wescon session agreed.

"The continued success of the T1 digital line is highly dependent upon a viable installation, test and general maintenance plan," J.S. Lombardi of Bell Telephone Laboratories noted.

"Newer and improved service offerings will undoubtedly require changes in maintenance strategy and innovation in test set design," he added.

In addition, he said the merging digital hierarchy in the Bell system will form the "basis of an interconnected digital network" and will provide "new challenges" to the designer of test equipment.

A typical test set for data communications systems contains approximately 100 integrated circuits or about 500 to 600 transistors, Raymond Sepe of International Data Sciences Inc. told the group.

This test equipment, he said, "is rapidly approaching the complexity of a minicomputer and perhaps designers of new test equipment should start thinking in that light."

Future test sets utilizing medium-scale integration will probably be 10 times more complex than those on the market today, he said.

"When you consider that this equipment must also be portable, you begin to realize that the task of designing good test equipment is formidable and not to be taken lightly," he said.

But if the problems in domestic data communications system testing are formidable, systems in the international field are even more formidable, Paul Silverman of RCA Global Communications Inc. indicated.

"International communications is a complex business fraught with challenging technical, operational and even political problems that must be resolved," he stressed.

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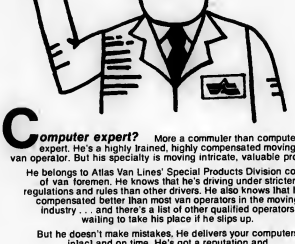

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Expert Disagrees With Recent Estimates

Chinese Between 1st, 2d Generation, IEEE Panel Told

By E. Drake Lundell Jr.
Of the CW Staff

SAN FRANCISCO – A computer expert from Nationalist China disagreed sharply with recent estimates of the state of computer development inside Mainland China at a special panel session during the IEEE Computer Society's annual conference here.

Dr. Kenneth K. Fan, presently a visiting scholar at Columbia University, said he had had the opportunity to inspect new Communist Chinese computers at a recent trade show in Toronto.

The technicians sent along with the exhibit, he said, spoke only Chinese, as he did, which gave him a "unique opportunity" to discuss the state of computer development and use in China.

From meeting with the Chinese for about eight hours, Fan concluded that the state of computer development in Mainland China lags far behind the U.S., differing with Prof. Thomas Cheatham of Harvard, who recently indicated the Chinese had third-generation computer-equipment [CW, Sept. 6].

Fan indicated he felt the computer exhibited by the Mainland Chinese both in Paris and Toronto is between the first and second generation, and definitely not third-generation equipment.

The system in Toronto, he said, the Cyigo-5 VJ6 Universal Digital Electronic Computer, used a magnetic drum to store its main memory which consisted of 32K 48-bit words. The system could do 100,000 calculation/sec, according to the Chinese technicians.

The system had a photo electric tape reader, the Model 5-8RG, that could read 1,000 "marks" a second. A console printer could operate at 20 line/sec printing 15 mark/line and a line printer – the CY160-5 – could print up to 300 line/min with 160 mark/line.

The technicians he spoke to in Canada had little knowledge of Fortran, Cobol or PL/1, but they did know some Algol. He said the group had said most of the programming was done in machine language.

The Chinese had built loaders for the computer that was exhibited, he said, but did not really have full operating systems in the common usage of the term.

The Chinese he met were not familiar with CRTs, time-sharing or virtual memory machines, he added.

In addition, he said the systems he inspected were transistorized, but did not use integrated circuits, in contrast to the machines seen by Cheatham and other U.S. experts.

The machines, he said, were used basically for scientific purposes and not for business or administrative jobs.

At the same meeting, Dr. Oleg Semenkov, director of the institute for engineering cybernetics in Minsk, USSR, disagreed with Fan.

While he noted he did not know the current state of the machines built by the Chinese, Semenkov said the Chinese who had been educated in Russia in the early 1960s would have more up-to-date technical knowledge than that indicated by Fan and would certainly be familiar with CRTs, Fortran, Cobol and time-sharing.

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Speed May Depend on Parallel Machines

SAN FRANCISCO – Computer designers might not have to go to faster components for faster throughput, attendees at the IEEE Computer Society conference were told.

Dave Kuck of the University of Illinois said many jobs currently being run in a serial fashion could be speeded up greatly by parallel operations.

Reporting on a five-year project at the university, Kuck said computer systems could be "induced from the algorithms" currently in use. In other words, he said, machines should be designed to fit the requirements of user problems as expressed in those algorithms.

Also, he said the design should maximize the use of presently inexpensive components and minimize the use of those more expensive components.

Minimum Memory

For example, he indicated that today processors were relatively cheap, while memory was not, so the designer should make the maximum use of processors and try to keep the memory to a minimum.

By increasing the number of processors, he said, the designer could allow the user to perform as many operations simultaneously as are now being done serially.

In the Illinois research program, for example, Kuck noted Fortran programs were broken down into those operations that could be done in parallel and those which could not be – indicating many of the operations could be done in parallel and few had to be done serially.

Because of this, he said, parallel machines could do many jobs they were originally considered unsuited for, such as regular business data processing.

Most of the processors in the system would be of a general-purpose nature, Kuck said, but there could be some special-purpose processors dedicated to specific functions. In other words, he said, specific program functions could be built into a processor chip.

Message-Switching Market Should Boom

NEW YORK – "After a number of false starts, the market for computer message and facsimile transmission services and equipment finally seems poised for an expansion," according to Frost and Sullivan, a market research firm here.

Alone, the market for computer message-switching service and equipment is expected to grow from $165 million this year to $385 million by 1977 and to $600 million by the end of the decade, the firm stated.

Competitive Forces

Most of the growth is expected in those business areas where competitive forces "necessitate that firms strive continuously to increase the speed, accuracy and effectiveness of their business communications," the firm predicted.

Another factor contributing to the large growth is a long-term sociological change away from the use of transportation in commerce and the substitution of telecommunication in the conduct of business affairs, as opposed to the more normal personal contact today, the firm added.

The major problems inhibiting the potential of the market are "the unusual risks and problems inherent in having to compete with entrenched utilities and government agencies, such as AT&T," the firm added.

The predictions were contained in a report entitled "Computer Message, Facsimile and Electronic Mail Systems."

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Bendix Mini Designed for Process Control

TETERBORO, N.J. – The new BDX-9000 minicomputer from Bendix Corp.'s Navigation and Control Division is designed for a wide range of process control applications. The BDX-9000 is a 16-bit, parallel-processing microprogrammable machine with a 2 μsec add time. The unit is compatible with the previously developed aerospace computer, the BDX-900.

Memory sizes range from 4K to 24K. A line of add-ons is being developed, including a 6 μsec multiply option and a fast fourier transform module, together with software, the company said.

Price for units with 4K memory is $5,500 in production quantities.

New OEM Products

Inselek Has SOS Memory

PRINCETON, N.J. – Inselek, Inc. has developed the AO2, a 256-bit random-access memory built from silicon-on-sapphire (SOS) for use in add-on and scratch-pad memories.

The unit has a 60-nsec cycle time, 35-nsec access time, with power dissipation of .5 mW/bit. In lots of 100, the AO2 costs $26.

Other New OEM Products

A line of 14 IBM-compatible modems from Vadic Corp., Mountain View, Calif., is available either in the basic module form, modules mounted on Vadic standard motherboards or modules mounted on customer-specified boards. OEM prices start at $225/mo.

– –

Computer Products, Inc. Fort Lauderdale, Fla., offers a 64-channel self-contained low-level multiplexing system, the RTP-7471, priced at $2,700.

– –

Two new A/D converters, the MP2913A and MP2914A, developed by Analogic Corp., Wakefield, Mass., provide conversions up to 13 bits or 14 bits, respectively, in 10 μsec.

– –

Dialight Corp., Brooklyn, N.Y., has introduced a solid-state hexadecimal readout with integral TTL circuit that accepts, stores and displays 4-bit binary data on a .27-in. character. In lots of 1,000, units cost $10 each.

– – –

The CEA1A Series of isolated power supplies from CEA, a division of Berkleonics, Inc., San Luis Obispo, Calif., provides integral isolation from 20dB up to 100 dB for IC circuits

Bendix BDX-9000

The new $895 ADC-HR16B analog/digital converter from Datel Systems Inc., Canton, Mass., is designed for systems demanding a wide dynamic range and can perform a 16-bit conversion in 50 μsec.

Michigan Center Orders 2 B6700s

LANSING, Mich. – The State of Michigan has ordered two Burroughs B6700 systems for the Central Systems Data Center.

The systems, valued at $4.6 million, will replace the center's current equipment and will be used to produce and process 10.5 million checks and process over four million income, sales and other tax returns each year.

The data center provides services to several state offices, including administration, agriculture, attorney general, auditor general, commerce, civil service, labor and treasury and the House and Senate.

Other Orders, Installations

Illinois Bell Telephone has ordered six add-on core memories from Electronic Memories & Magnetics Corp. for use with IBM 360/30 computers.

The Decasystem 10 at Applied Data Research, Inc., has been expanded with the installation of a second central processing unit and peripherals from Digital Equipment Corp.

The American Stock Exchange has ordered 30 MDR Optical Mark Readers from Bell & Howell's Electronics and Instrument Group for use in the new Amcode trading system.

Associated Grocers of Alabama, Inc., has installed a Burroughs B2500 system for sales analysis, merchandising history, inventory control, billing and payroll.

Public Service Electric and Gas Co. has ordered a Univac 1106 multiprocessor for time-sharing, interactive program development and commercial and engineering applications.

Datatype Corp. has installed a Dataflow Optical Page Reader and Mohrtext Video Display Terminal at the *Waukegan News-Sun* newspaper. The OCR unit "reads" copy typed on IBM Selectrics with the DF-2 print element and inputs directly into the CRT where the text is displayed and edited. Output is a "clean tape" which feeds into the composing room machines.

Orders & Installations

The county government and school board of Prince William County in Virginia have jointly ordered a Burroughs B2500 for scheduling of classes, reporting and student use, as well as government accounting applications.

The Veterans Administration Hospital, Pittsburgh, has installed a Control Data Corp. Cardiotest II computerized medical system for on-line acquisition, processing and reporting of electrocardiograms.

Chemical Bank in New York has purchased a credit card processing system from First Data Resources Inc.

Expansions

National Cash Register is building a 58,000-sq-ft business forms plant in Peterborough, N.H.

Memory Technology, Inc. has purchased a 23,500-sq-ft building adjacent to its Wayland, Mass., facility to house expanded development and manufacturing operations for semiconductor memories.

Honeywell plans to build a 100,000-sq-ft addition to its Phoenix manufacturing complex.

Modular Computer Systems, Inc. has moved to a new 35,000-sq-ft building which more than triples the space previously available.

Computer Automation, Inc. has moved to a 73,000-sq-ft building in Irvine, Calif.

Information Storage Systems, an Itel subsidiary, is adding 100,000 sq. ft. to its product development and manufacturing facility at Cupertino, Calif.

Kybe Corp. has expanded its facilities by 50%. The space will be used for manufacturing and engineering.

GTE Information Systems is planning to construct an 80,000-sq-ft plant in Anaheim, Calif.

Computer Transmission Corp. has moved its engineering, production and corporate offices to a 20,000-sq-ft plant in El Segundo, Calif.

True Data Corp. has moved to a new plant in Irvine, Calif.

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Com-Share Pegs 1st Annual Profit; Other T/S Firms Improve Results

Three time-sharing firms have turned in improved reports, led by Com-Share, which scored its first profitable year since its founding in 1966.

International Timesharing Corp. cut in half its losses for the year ended May 31 compared with a year ago, and Tymshare, Inc.'s second quarter earnings jumped 112%.

At Com-Share, earnings for the year ended June 30 totaled $313,012 or 29 cents a share, compared with a loss of $1.2 million or $1.46 a share in 1971. Revenues rose to $6.8 million from $5.2 million.

President Richard L. Crandall cited the firm's entry into the data management marketplace as a prime factor in the attainment of profitability.

International Timesharing Corp., a Minneapolis-based firm, cut its loss for the year ended May 31 to $27,304 or 1 cent a share from $54,698 or 3 cents a share in 1971.

Revenues rose to $3.2 million from $2.5 million.

In the first nine months, the firm had earnings of $46,566 and fourth quarter revenues reached $889,935, "the largest quarterly revenue production in the company's history."

The loss for the year resulted from the firm's expansion plans, according to Chairman Lachlan Reed.

Second quarter earnings jumped 112% and revenues 215% at Tymshare, Inc. Earnings for the period ended June 30 reached $224,913 or 7 cents a share, compared with $105,558 or 4 cents a share in the year ago period.

Revenues climbed to $3.8 million from $3.1 million in the same period.

Results for the six months showed earnings of $335,351 or 11 cents a share, compared with $228,750 or 8 cents a share a year ago.

Revenues totaled $7.3 million, up from almost $6 million in the same 1971 period.

Mohawk Scores Profit In First Quarter

HERKIMER, N.Y. — Bolstered by $3.2 million revenue from the sale of equipment on lease to Randolph Computer Co., Mohawk Data Sciences reported earnings of $289,000 or 5 cents a share for the first quarter ended July 31.

This was in contrast to the loss of $765,000 incurred in the year ended July 31, but down from the $460,000 or 8 cents a share earned in the year ago quarter, on revenues of $26.4 million.

Revenues reached a record $33.5 million with revenue from rentals and service rising to $19 million in the quarter, from $14.3 million a year earlier, the firm said.

Cybermatics Earnings Decline in 1st Period

NEW YORK — Cybermatics Inc.'s first quarter revenues rose, but earnings declined, despite the acquisition of Automated Labels & Forms Inc. which contributed $19,629 or 2 cents a share.

The problems of "significant overruns of target cost on two large fixed price contracts" and the reduction of profit margins on systems contracts "that became evident in the software division last year continued to adversely affect this quarter," observed President J. Roy Morris.

Earnings for the period ended June 30 were $43,088 or 4 cents a share, down from $62,247 or 6 cents a share. Revenues rose to $1.9 million from $1.5 million.

"We are now seeing a trend upward in the software and computer communications marketplace," Morris said.

Earnings Reports

SYCOR
Three Months Ended June 30

	1972	1971
Shr Ernd	$.05	...
Revenue	3,132,200	$1,958,100
Earnings	123,506	(352,900)
6 Mo Shr	.25	...
Revenue	6,077,000	3,630,100
Earnings	159,200	(597,200)

DATATAB
Six Months Ended June 30

	1972	1971
Shr Ernd	* $.11	##.10
Revenue	2,945,794	2,024,574
Spec Chg	4,476	...
Earnings	98,070	64,739

*Adjusted for a 50% stock dividend in February 1972.

LEASCO
Three Months Ended June 30

	1972	1971
Shr Ernd	$.73	$.51
Revenue	162,761,000	148,476,000
Earnings	11,862,000	8,156,000
6 Mo Shr	1.28	1.00
Revenue	315,864,000	293,000,000
Earnings	20,464,000	15,937,000

FERTEC
Year Ended June 30

	e1972	1971
Shr Ernd	$.64	$.69
Revenue	22,900,000	21,368,000
Earnings	2,000,000	1,956,000
3 Mo Shr	.14	.20
Revenue	6,100,000	5,898,000
Earnings	400,000	568,000

e-Preliminary.

COMPUTER USAGE
Three Months Ended June 30

	1972	1971
Shr Ernd	$.16	$.08
Revenue	1,024,710	1,131,303
Tax Cred	64,586	37,564
Earnings	134,554	78,258
9 Mo Shr	.32	.16
Revenue	2,620,663	3,260,331
Tax Cred	128,596	85,293
Earnings	267,904	136,028

Nickels & Dimes

EDP Resources has made an additional depreciation charge of $10 million against its fiscal year ended April 30, resulting in a loss of about that amount for the period. Revised estimates of revenue producing value of equipment range from four to 10 years, rather than the previous 10.

$$$

Sanders Data Systems met its sales goal of $20 million for fiscal 1972 and showed an operating profit in the fourth quarter.

$$$

Memorex has completed the sale and leaseback of its new administration and manufacturing facility for equipment products in Santa Clara, Calif. The sale price was $18.3 million. Net proceeds are being applied to reduction of bank debt.

$$$

Datronic Rental's revenues climbed for the 11th consecutive year, but a depreciation charge of $975,875 and extraordinary charges of $98,947 resulted in a loss of $709,062, the first year loss since 1964, according to the company.

$$$

Telefile Computer's third quarter earnings of $36,162 offset the losses posted in the previous two quarters, for the nine months profit of $5,309.

$$$

Computility's business during May and June reduced an anticipated second quarter loss. The firm lost $2,430 for the period ended June 30, compared with a $37,832 loss in the 1971 period.

$$$

Some issues to be voted upon by **DPF** shareholders Sept. 28 involve increasing the stockholder vote required to approve certain mergers and similar transactions and to amend certain provisions of the Certificate of Incorporation and Bylaws.

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TRADE*QUOTES

Computerworld Stock Trading Summary

All statistics compiled, computed and formatted by TRADE*QUOTES, INC Cambridge, Mass 02139

CLOSING PRICES THURSDAY, SEPTEMBER 21, 1972

E X C H		1972 RANGE (1)	SEP 21 CLOSE 1972	WEEK NET CHNGE	WEEK PCT CHNGE
		SOFTWARE A EDP SERVICES			
O	ADVANCED COMP TECH	1- 3	2 3/4	0	0.0
A	APPLIED DATA RES.	4- 7	4 5/8	- 5/8	-12.5
A	APPLIED LOGIC	1- 4	2 5/8	+ 1/8	+5.0
N	AUTOMATIC DATA PROC	72- 99	89 5/8	+1 3/4	+1.9
O	BRANDON APPLIED SYST	1- 2	1 1/8	0	0.0
O	COMPUTER DIMENSIONS	6- 14	7 1/4	+ 3/4	+11.5
O	COMPUTER DYNAMICS	1- 4	7/8	- 1/8	-12.5
O	COMPUTER NETWORK	4- 7	5	- 1/2	-9.0
N	COMPUTER SCIENCES	5- 10	5 5/8	+ 1/8	+2.2
O	COMPUTER TASK GROUP	1- 2	1	0	0.0
O	COMPUTER TECHNOLOGY	4- 8	4	0	0.0
O	COMPUTER USARE	7- 14	8 1/2	+ 5/8	+7.9
O	COMP AUTOMOT REPORTS	5- 9	8 3/8	- 1/4	+5.0
N	COMPUTING & SOFTWARE	14- 28	13 7/8	- 1/8	-0.9
O	COMRESS	1- 3	1 1/4	- 1/8	-9.0
O	COMSHARE	5- 10	6 1/4	- 1/8	-1.9
O	DATATAB	5- 9	6 3/8	- 1/8	-1.6
O	EDP RESOURCES	3- 8	2 5/8	- 1/4	-8.3
A	ELECT COMP PROG	1- 5	1 7/8	0	0.0
N	ELECTRONIC DATA SYS.	43- 63	52 1/2	+ 5/8	+1.2
O	INFORMATICS	4- 11	5 5/8	+ 1/4	+4.5
O	I.O.A. DATA CORP	1- 3	1 1/4	0	0.0
O	KEANE ASSOCIATES	4- 7	5 3/4	0	0.0
O	MATHTA CORP	7- 13	12	0	0.0
O	LONICON	4- 9	5 3/8	+ 5/8	+13.1
A	MANAGEMENT DATA	5- 10	5	0	0.0
O	NATIONAL CSS INC	8- 28	24 1/4	-1 3/8	-5.5
O	NATIONAL INFO SRVCS	2- 7	7 1/8	0	0.0
P	ON LINE SYSTEMS INC	8- 20	18 1/2	- 1/2	-2.6
N	PLANNING RESEARCH	4- 17	7 3/4	-1 3/8	-15.0
O	PROGRAMMING METHODS	20- 34	21 1/2	0	0.0
N	PROGRAMMING & SYS	1- 2	1	- 1/8	-11.1
O	RAPIDATA INC	5- 25	23	+ 1/2	+2.2
O	SCIENTIFIC COMPUTERS	4- 5	4	0	0.0
O	SIMPLICITY COMPUTER	1- 5	4	+ 1/8	+3.2
O	TBS COMPUTER CENTERS	4- 6	4 1/2	0	0.0
O	TCC INC	1- 3	1 1/8	0	0.0
O	TYMSHARE INC	7- 11	7 3/4	0	0.0
O	UNITED DATA CENTER	5- 10	5	- 1/4	-4.8
N	UNIVERSITY COMPUTING	13- 28	12 5/8	0	0.0
A	URS SYSTEMS	6- 10	8 1/4	- 1/4	-2.9
	PERIPHERALS & SUBSYSTEMS				
N	ADDRESSOGRAPH-MULT	34- 49	40 1/2	-1	-2.4
O	ADVANCED MEMORY SYS	12- 32	15	-2 1/4	-15.7
W	AMPEX CORP	5- 25	5 3/8	- 3/4	-12.7
O	ANDERSON JACOBSON	5- 8	4	- 3/8	-8.5
O	ATLANTIC TECHNOLOGY	1- 11	5/8	0	0.0
O	REEHIVE MEDICAL ELEC	1- 5	4 3/4	+ 1/2	+15.3
A	BOLT,BERANEK A HEM	5- 21	17 3/4	- 1/4	-1.4
N	BUNKER-RAMO	9- 14	10 1/8	0	0.0
A	CALCOMP	11- 25	11	- 1/8	-1.1
O	CAMBRIDGE MEMORIES	9- 15	10 1/2	- 1/8	-1.2
O	CENTRONICS DATA COMP	21- 53	45 1/2	-3 1/2	-7.4
O	COGNITRONICS	2- 5	2 5/8	+ 1/4	+10.5
O	COMPUTER COMMUN.	1- 7	1 7/8	- 1/8	-6.5
A	COMPUTER EQUIPMENT	3- 4	2 5/8	- 1/8	-4.6
O	COMPUTER MACHINERY	7- 13	8 7/8	- 1/4	-2.7
A	COMPUTEST	4- 9	5 1/8	- 1/8	-2.4
A	DATA PRODUCTS CORP	3- 7	3 5/8	- 1/8	-3.3
O	DATA RECOGNITION	1- 5	1 1/4	0	0.0
O	DATA TECHNOLOGY	1- 5	2 5/8	0	0.0
O	DI/AN CONTROLS	0- 8	4 3/4	0	0.0
N	ELECTRONIC M A M	4- 8	5 3/8	- 1/8	-3.3
O	FABRI-TEK	9- 5	2 3/4	- 1/4	-8.3
O	GENERAL COMPUTER SYS	7- 16	9 1/2	- 1/4	-2.5
W	GENERAL ELECTRIC	59- 70	65	0	0.0
N	HAZELTINE CORP	8- 13	8	- 1/4	-3.0
O	INFOREX INC	20- 36	20	0	0.0
O	INFORMATION DISPLAYS	1- 5	2 1/2	- 1/8	-4.8
A	LUNDY ELECTRONICS	6- 14	9 7/8	- 1/4	-2.4
O	MANAGEMENT ASSIST	1- 2	1 7/8	0	0.0
N	MEMOREX	16- 38	18 5/8	+2 1/8	+13.0
A	MILGO ELECTRONICS	17- 46	24 5/8	+ 1/8	+0.5
M	MONANK DATA SCI	14- 27	15 1/2	0	0.0
O	OPTICAL SCANNING	1- 7	1 7/8	0	0.0
O	PRTEC CORP	0- 17	9	+ 1/4	+2.8
O	PHOTON	7- 15	7 3/4	- 5/8	-7.4
A	POTTER INSTRUMENT	8- 21	8 1/4	- 1/4	-3.4
O	PRECISION INST.	1- 13	5	- 1/4	-4.7
O	RECOGNITION EQUIP	7- 15	7	- 1/4	-3.3
O	SANDERS ASSOCIATES	13- 21	14 1/4	- 3/8	-2.5
O	SCAN DATA	7- 13	7 1/2	- 1/4	-3.2
O	STORAGE TECHNOLOGY	17- 29	18 1/2	- 3/8	-2.2
O	SYCOR INC	7- 11	9 3/4	0	0.0
O	TALLY CORP.	8- 15	11 1/2	+1 1/2	+15.0
W	TEKTRONIX INC	34- 64	51	-2 1/8	-4.0
N	TELEX	4- 15	7 1/2	- 1/2	-7.1
O	WILTEK INC	10- 26	17 3/4	- 1/4	-1.4
	SUPPLIES A ACCESSORIES				
O	BALTIMORE BUS FORMS	6- 9	7	0	0.0
A	BARRY WRIGHT	7- 24	11 7/8	+ 3/4	+6.7
A	DATA DOCUMENTS	7- 26	19 1/2	- 1/2	-2.5
O	DUPLEX PRODUCTS INC	6- 16	8	- 1/8	-1.5
W	ENNIS BUS. FORMS	7- 20	7 7/8	+ 1/8	+1.6
O	GRAHAM MAGNETICS	15- 27	17 5/8	-1	-5.3
O	GRAPHIC CONTROLS	12- 35	33 3/4	+1 3/4	+38.0
N	3M COMPANY	76- 85	77 1/4	-1 7/8	-2.3
O	MOORE CORP LTD	43- 56	52 1/4	- 1/4	+0.4
N	NASHUA CORP	48- 62	56 3/8	- 1/8	-0.2
O	REYNOLDS & REYNOLD	37- 77	42 5/8	+ 7/8	+2.0

E X C H		1972 RANGE (1)	SEP 21 CLOSE 1972	WEEK NET CHNGE	WEEK PCT CHNGE
O	STANDARD REGISTER	14- 20	16 1/2	- 5/8	-3.6
O	TAB PRODUCTS CO	14- 21	20 1/2	- 3/4	-3.5
M	UARCO	22- 28	21 7/8	0	0.0
A	WABASH MAGNETICS	7- 11	7 1/4	+ 1/8	+1.7
N	WALLACE BUS FORMS	22- 26	22 1/8	- 5/8	-2.7
	COMPUTER SYSTEMS				
N	BURROUGHS CORP	147-226	210 1/4	+3 3/4	+1.8
N	COLLINS RADIO	14- 20	15 1/8	+ 1/2	+3.4
O	CONTROL DATA CORP	45- 78	70 1/4	-1 1/8	-1.5
O	DATA GENERAL CORP	56-115	104 1/2	+6	+6.0
O	DIGITAL COMP CONTROL	9- 25	11 3/4	- 1/2	-4.0
N	DIGITAL EQUIPMENT	72-101	85 5/8	- 5/8	-4.0
N	ELECTRONIC ASSOC.	6- 13	9	+ 3/8	+4.5
A	ELECTRONIC ENGINEER.	6- 14	6 1/2	- 1/4	-3.7
N	FOXBORO	26- 41	27 3/8	- 1/4	+0.9
O	GENERAL AUTOMATION	13- 38	32 1/2	- 1/4	-0.7
O	GRI COMPUTER CORP	3- 5	3 3/4	0	0.0
N	HEWLETT-PACKARD CO	46- 77	66 1/2	- 5/8	-0.9
M	HONEYWELL INC	130-170	141 3/4	+4	+2.7
N	IBM	353-426	399 1/2	0	0.0
O	INTERDATA INC	8- 16	11	- 1/8	-1.1
O	MICRODATA CORP	5- 10	8	0	0.0
N	RAYTHEON CO	24- 37	35 1/2	- 5/8	-1.7
N	SPERRY RAND	30- 48	43 3/4	- 1/4	+1.7
A	SYSTEMS ENG. LABS	10- 16	9 3/4	- 3/8	-3.7
M	VARIAN ASSOCIATES	14- 22	21 3/8	+1 5/8	+8.2
N	VICTOR COMPTOMETER	15- 24	18 1/8	- 7/8	-4.6
N	WANG LABS.	32- 61	51 7/8	-2	-5.9
N	XEROX CORP	121-172	150 7/8	-2 1/4	-1.4
	LEASING COMPANIES				
A	GOOTHE COMPUTER	5- 18	4 1/2	- 5/8	-12.1
O	BRESSNAHAN CORP.	2- 3	2	0	0.0
O	COMDISCO INC	8- 18	15 1/2	0	0.0
O	COMMERCE GROUP CORP	5- 11	6 5/8	- 1/4	-3.6
O	COMPUTER EXCHANGE	1- 5	1	- 1/8	-11.1
A	COMPUTER INVSTRS GRP	8- 14	8 3/8	- 5/8	-6.9
N	DPF INC	9- 13	5 1/4	- 5/8	-10.6
M	DATRONIC RENTAL	9- 4	1 7/8	0	0.0
O	DCL INC	5- 10	4 5/8	- 5/8	-11.9
A	DEARBORN-STORM	16- 26	17 3/4	+ 1/4	+1.4
A	DPA, INC.	5- 8	5 7/8	+ 1/2	+9.3
O	GRANITE MGT	5- 11	6 3/8	+ 1/4	-3.7
A	GREYHOUND COMPUTER	6- 11	6 1/4	+ 1/8	+2.0
A	LYTEL	7- 12	7 7/8	- 1/4	-3.0
N	LEASCO CORP	17- 24	19 1/8	- 1/8	-0.6
O	LEASPAC CORP	7- 15	7 1/4	-1 1/2	-17.1
A	LECTRO MGT INC	4- 8	5 7/8	- 1/4	-10.1
A	ROCKWOOD COMPUTER	2- 7	2 1/2	- 1/8	-4.7
O	SYSTEMS CAPITAL	13- 20	13 7/8	- 1/8	+0.9
N	U.S. LEASING	19- 33	30 1/2	- 1/2	-1.6

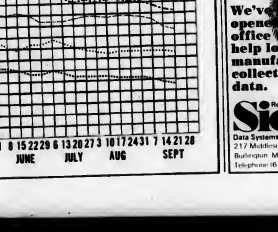
All statistics compiled, computed and formatted by TRADE*QUOTES, INC Cambridge, Mass 02139

EXCH: N=NEW YORK EXCHANGE; A=AMERICAN EXCHANGE
L=NATIONAL EXCHANGE; O=OVER-THE-COUNTER
P=PHILA-BALT-WASH

O-T-C PRICES ARE BID PRICES AS OF 3 P.M. OP LAST BID
(1) TO NEAREST DOLLAR

Computer Stocks Trading Index

Computer Systems ----- Software & EDP Services
Peripherals & Subsytems ..... Leasing Companies
Supplies & Accessories -.-.- CW Composite Index



Earnings Reports

POTTER INSTRUMENT
Year Ended June 30

	1972	1971
Shr Erng	.....	8.49
Revenue	$34,928,000	30,961,000
Spec Chg	a1,847,000	
Earnings	(13,133,000)	1,350,000

a-Cumulative effect on prior years of change in basis for valuation of equipment for lease.

BRESNAHAN COMPUTER
Three Months Ended June 30

	1972	1971
Shr Erng	8.07	8.06
Revenue	1,489,000	1,252,000
Earnings	151,000	106,000
9 Mo Shr	.23	.12
Revenue	4,300,000	3,906,000
Loss Disc Op	.....	114,000
Earnings	460,000	229,000

SCAN-DATA
Three Months Ended June 30

	1972	a1971
Revenue	$702,290	$342,241
Loss	333,447	398,014
8 Mo Rev	1,940,871	641,848
Loss	382,643	833,518

a-Restated.

DATA 100
Three Months Ended June 30

	1972	1971
Revenue	$2,368,000	$748,000
Loss	1,826,000	1,041,000
6 Mo Rev	4,059,000	1,308,000
Loss	3,400,000	2,138,000

COMPUDYNE
Three Months Ended June 30

	1972	1971
Shr Erng	$.05	.....
Revenue	5,723,662	$4,922,798
Earnings	212,116	d(272,619)
9 Mo Shr	.10	.....
Revenue	17,130,333	16,069,921
Earnings	487,127	d(734,612)

d-In the quarter's results after one-time non-recurring operating losses of $211,731, and in the nine months, $734,876 losses from termination of the Hatboro, Pa., operation and money product lines to new plant; amortization of debt discount and loan fees associated with long-term financing in June 1968.

SIERRA RESEARCH
Six Months Ended June 25

	1972	1971
Shr Erng	$.11	4.06
Revenue	7,164,475	5,713,350
Earnings	494,807	47,134

a-About $49,000 resulted from favorable resolution of a controversy with a customer concerning allowable contract costs.

PROGRAMS & ANALYSIS
Six Months Ended May 27

	1972	1971
Shr Erng	$.05	$(.03)
Revenue	1,094,000	762,000
Earnings	49,500	(29,000)

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ISC/PRYOR COMPUTER

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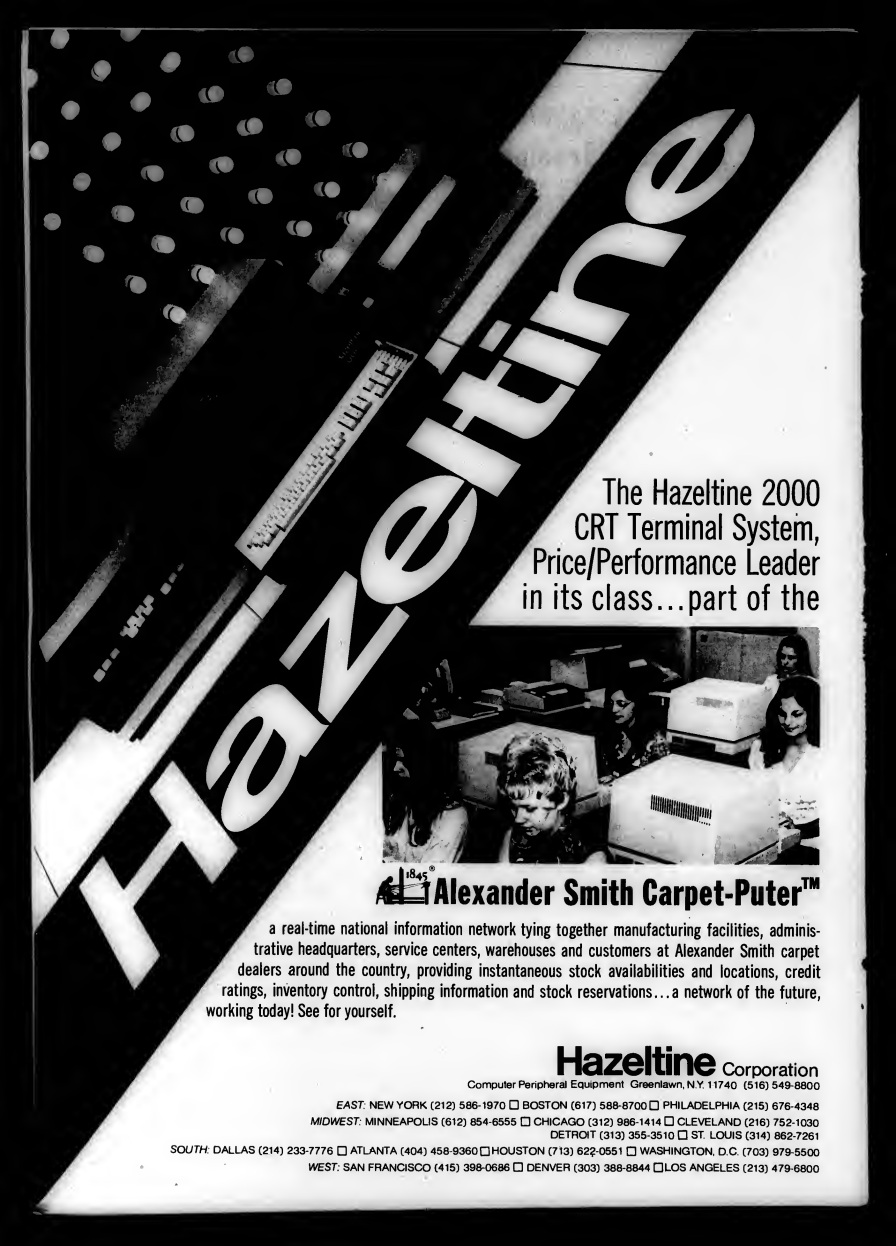

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